MATHEMATICS-X

MODULE-8

INDEX

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STATISTICS

INTRODUCTION

We have already learnt about classification of givendata into ungrouped as well as grouped frequency distribution. we have also learnt to represent the data pictorially in the form of various groups such as bar graphs, histograms and frequency polygon.

Now, we shall study certain numerical representatives of the ungrouped data, also called measures of central tendency. We shall also extend the study of mean, median, mode to grouped data, We shall also discuss cumulative frequency distribution and to draw ogives.

Means of grouped data

Direct method : If n observation, occuring with frequencies.

$f_1, f_2, \ldots . f_n$ respectively then,

$$\bar{x} = \frac{f_1x_1 + f_2x_2 + f_2x_3 + \ldots\ldots + f_nx_n}{f_1 + f_2 + f_3 + \ldots\ldots + f_n} = \frac{\sum_{i=1}^{n} f_i x_i}{\sum_{i=1}^{n} f_i}$$

Assumed mean

In this method arbitrary mean 'a' is chosen which is called assumed mean, somewhere in the middle of all values of x.

If $\sum f_i d_i = f_1 (x_1 - a) + f_2(x_2 - a) + \ldots\ldots + f_n(x_n - a)$, then

$$\text{Mean} = \bar{x} = a + \frac{\sum f_i d_i}{\sum f_i}$$

Step-deviation methd

Some times during the application of the short-cut method for finding mean deviation all d_i are divisible by a common number h (say). In such a case the calculations are reduced to a great extent by taking.

$$u_i = \frac{x_i - A}{h} = \frac{d_i}{h}, \text{ then } \bar{x} = A + \frac{\sum_{i=1}^{n} f_i u_i}{N} \times h$$

Finding mean by using this formula is known as the step-deviation method.

Mode of Grouped data

To find the mode or modal value of group distibution (continuous series):

Step 1 : Find the modal class by inspection method.

Step 2 : After finding modal class use the following formula for finding exact value of mode.

$$\text{Mode} = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h$$

where, l = lower limit of the modal class,

h = size of the class-interval (assuming all class sizes to be equal),

f_1 = frequency of the modal class,

f_0 = frequency of the class preceding the modal class,

f_2 = frequency of the class succeeding the modal class.

Median :

Median means mid value. Median is that value of the variable which divides the distribution into two equal parts, when arranged in ascending order or descending order.

For ungrouped data, the median occupies the $\frac{N+1}{2}$th position. Where N is the total number of frequencies. Before discussing the median for grouped frequency distribution, we shall have first introduce the concept of cumulalive frequency. In case of grouped data. Introduce the concept of cumulative frequency.

$$\text{Median} = l + \left(\frac{\frac{n}{2} - cf}{f} \right) \times h \ ;$$

Where, l = lower limit of median class,

n = number of observations,

cf = cumulative frequency of class preceding the median class,

f = frequency of median class,

h = class size (assuming class size to be equal).

Relationship among mean median and mode

3 Median = Mode + 2 Mean;

Mode = 3 Median –2Mean;

$$\text{Mean} = \text{Mode} + \frac{3}{2}(\text{median} - \text{Mode})$$

CUMULATIVE FREQUENCY CURVE OR AN OGIVE

Frequency curve

The frequency curve of a frequency distribution is obtained by drawing a free hand curve, preferably through the points of the frequency polygon.

Ogives

Ogives are also called cumulative frequency curves. Ogives are of two types (i) less than ogive (ii) more than ogive. The 'less than ogive' of a frequency distribution is obtained by joining the points with abscissa as upper limit of classes and ordinate as corresponding number of items less than the upper limit. The point (lower limit of first class) 0 is also taken.

The 'more than ogive' of a frequency distribution is obtained by joining the points with abscissa as lower limit of classes and ordinates as corresponding number of items more than that of lower limit the point 0 (upper limit of last class) is also taken.

Data: The word data means information or a set of given facts.

Statistics: We use the word, **'STATISTICS'** in two sources:

(i) In plural: Statistics means data.

(ii) In singular form: It is the science which deals with the collection, presentation, analysis and interpretation of numerical data.

COLLECTION OF DATA

(a) Primary data: The data collected by the investigator himself with a definite plan in mind, are known as primary data. These data are therefore, highly reliable and relevant.

(b) Secondary data: It is not along possible for an investigator to collect data, due to lack of time, money and resources.

The data collected by some one else, other than the investigator are known as secondary data.

Presentation of data: The data obtained in original form are called raw data or ungrouped data.

An arrangement of raw numerical data in ascending or descending order of magnitude, is called an array.

Putting the data in the form of tables, in condensed form is known as the presentation of data.

Frequency of an observation: The number of times an observation occurs is called the frequency of observation.

Frequency distribution is a tabular arrangement of data. A frequency distribution is a tabular arrangement of data showing the frequency of each observation.

Grouped data: We may condence the data into classes or groups. Such a presentation is known as a grouped data.

Types of frequency data:

Inclusive (discontinuous) form: The upper limit of a class is included. So such a frequency distribution is called an inclusive form.

Exclusive (continuous) form: When classes are formed in such a way that the upper limit of a class is included in this class and is included in the class, then such a form of frequency distribution is known as an exclusive form.

SOME DEFINITIONS

Variate or variable: Any character which is capable of taking several different values is called a variate.

Class interval: Each group into which the raw data is condensed is called a class interval. Each class is bounded by two figures, which are called the crass limits. The figure on the left side of a class is called its lower limit and that on the right is called its upper limit.

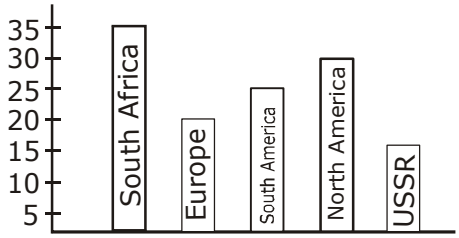
Class size: The difference between the true upper limit and the true lower limit of a class is called its class size.

Class mark or mid value: The class mark of a class is defined as

$$\text{Class mark of a class} = \left[\frac{\text{upper limit} + \text{lower limit}}{2}\right]$$

Note: Class size is the difference between any two successive class marks.

Range: The difference between the maximum value and the minimum value of the variable is called the range.



ARITHMETIC MEAN:

(a) The mean of 'n' observations x1,x2, x3 ..... xn is $\bar{x} = \frac{x_1 + x_2 + x_3 + ... + x_n}{n} = \frac{1}{n}\sum_{i=1}^{n} x_i$

(b) Let $\bar{x}$ be the mean of n numbers is k is added to each number, new mean = $\bar{x}$ + k. If k is subtracted from each number new mean = $\bar{x}$ – k.

If each number is multiplied by k, new mean: k$\bar{x}$.

If each number is divided by k, new mean = $\bar{x}$/k.

(c) Sum of observation is equal to the number of observation X mean.

(d) If n observations in the raw data consist of only k distinct values x_1, x_2, x_3, ... x_k of the variable x occurring with frequencies f_1, f_2, f_3 ..... f_k respectively, then

$$\bar{x} = \frac{f_1x_1 + f_2x_2 + ... + f_kx_k}{f_1 + f_2 + ...f_k} = \frac{\sum_{i=1}^{k} f_ix_i}{\sum_{i=1}^{n} f_i} \frac{1}{n}\sum_{i=1}^{k} f_ix_i$$

Where, $\frac{1}{n}\sum_{i=1}^{k} f_i$ denotes total frequency.

(e) When the raw data are presented in the form of a frequency distribution with equal or unequal, exclusive or inclusive class intervals, we assume that the frequency in any class is centred at its class mark (or mid-point).
Class mark of any class interval the mean of the upper and the lower limit of the interval.

i.e., $\frac{\text{upper limit} + \text{lower limit}}{2}$

1. **Short cut method for computing mean.** In this method an arbitrary constant a is chosen which is called origin or assumed mean some where in the middle of all values of x_i. If h is the difference of any two consecutive values of x_i, then $u_i = \frac{x_i - a}{h}$

Mean = $\bar{x} = a + \frac{h}{n}\sum_{i=1}^{k} f_i u_i = a + h\bar{u}$

(g) The algebraic sum of the deviations of a set of values from their arithmetic mean is zero.

i.e., $\sum_{i=1}^{k} f_i(x_i - x) = 0$

2. **Weighted arithmetic mean:** If $x_1, x_2, \ldots\ldots\ldots x_n$ denote n values of the variable x and $w_1, w_2 \ldots\ldots\ldots w_n$ denote respectively their weights then their weighted mean.

$$\bar{x}_w = \frac{\sum_{i=1}^{n} w_i x_i}{\sum_{i=1}^{n} w_i}$$

If the weight of each observation is one, then weighted mean = arithmetic mean.

3. **Combined mean:** If $\bar{x}_1$ and $\bar{x}2$ are the means of two groups having same unit of measurement computed from n1 and n2 values respectively, then the mean $\bar{x}$ of the variate values of the two group then together is given by

$$\bar{x} = \frac{n_1\bar{x}_1 + n_2\bar{x}_2}{n_1 + n_2}$$

4. **Median for ungrouped data:** Median is the value of the middle most item. It is a positional average calculation of median involves the following step:
(i) Arranging the values in ascending or descending order.

(ii) If the number of observation ie. n is odd then median = $\left(\frac{n+1}{2}\right)$th term.

On the other hand is the number of observation ie. n is even, then median is the arithmetic mean = $\frac{n}{2}$th term and $\frac{n}{2}+1$th term.

5. **Mode of ungrouped data:** Mode is the value observation which occurs greatest number of times or with greatest frequency.

6. Vital statistics: Vital statistics are numerical records of births, deaths, marriages, divorces, etc., in a given community.

(a) Crude Birth Rate (CBR): Crude birth rate is the number of birth per thousand of the population.

$$CBR = \frac{\text{Number of birth during a given year}}{\text{Mid year population during year}}$$

(b) Crude Death Rate (CDR): CDR is the number of deaths per thousand of population.

$$CDR = \frac{\text{Number of deaths during a given year}}{\text{Mid year population during year}} \times 10$$

(c) Specific Death Rate (S_TDR): It is the number of deaths per 1000 of the population in a specific class in a given year.

SDR =

$$\frac{\text{Number of deaths in the age group in the given year}}{\text{Mid year population in that group}}$$

× 1000 in the given year

(d) Standard Death Rate (SDR): It is defined as follows:

$$STDR = \frac{\sum_n S_x D_x}{\sum_n S_x}$$

Where, S_x = standarised population for group n.

D_x = specific death rate for group n.

(e) Infaint Morality Rate (IMR): It is the number of in a fants, under one year of age, during in a year per 1000 line births of the same year.

7. Consumer price index number

(a) Aggregative Method: Consumer price index number = $\frac{\sum p_i q_i}{\sum p_0 q_0} \times 100$

Where, p_0 = price of base year

q_0 = quantity of base year

p_i = price of current year

q_i = quantity of current year

(b) Cost of living index = $\frac{\sum w_i p_i}{\sum w_i}$

Where, w_i = weight in terms of percentages

$$P_i = \frac{p_i}{p_0} \times 100$$

p_0 = price of base year

p_i = price of current

Quartiles:

(i) For ungrouped data:

(a) arrange in ascending or descending order

(b) Q_1 is the value $\left(\frac{n+1}{4}\right)^{th}$ of term

(c) Q_2 is the value of $\left(\frac{n+1}{2}\right)^{th}$ term if n is odd, and $\frac{1}{2}\left[\left(\frac{n}{2}\right)^{th}\text{term}+\left(\frac{n}{2}+1\right)^{th}\text{term}\right]$ even.

(d) Q_3 is the value of $3\left(\frac{n+1}{4}\right)^{th}$ term.

(ii) For discrete frequency distribution:

(a) Arrange in ascending or descending order

(b) Q_1 is the value of $\left(\frac{n}{4}\right)^{th}$ term, n is total frequency

(c) Q_2 is same as median.

(d) Q_3 is the value of $3\left(\frac{n}{4}\right)^{th}$ term.

Deciles: Value of deciles D_1, D_2 ..... D_9 is found in the same way as value Q_1, Q_3 .....

D_1 = value of $\left(\frac{n+1}{10}\right)^{th}$ term

D_7 = value of $7\left(\frac{n+1}{10}\right)^{th}$ term

D_i = value of $i\left(\frac{n+1}{10}\right)^{th}$ term

D_5 = is the same as median

PERCENTILE

$P_i = i\left(\frac{n+1}{100}\right)th$

Time series: When quantitative data are arranged in order of their occurrence, the resulting statistical series is called a time series and is used for measuring trends.

SOLVED PROBLEMS

Ex.1 Find the mean wage from the followign data

Wages (in Rs)	800	820	860	900	920	980	1000
No. of workers	7	14	19	25	20	10	5

Sol. Let the assumed mean be A = 900 and h = 20

Wage (in Rs) x_i	No. of workers f_i	$d_i = x_i - a = x_i - 900$	$u_i = \frac{x_i - 900}{20}$	$f_i u_i$
800	7	–100	–5	–35
820	14	–80	–4	–56
860	19	–40	–2	–38
900	25	0	0	0
920	20	20	1	20
980	10	80	4	40
1000	5	100	5	25
Total	$N=\Sigma f_i = 100$			$\Sigma f_i u_i = -44$

We have : $N = 100, \Sigma f_i u_i = -44, A = 900$ and h = 20.

$\therefore$ Mean $= \bar{x} = A + \frac{\Sigma f_i u_i}{N} \times h \quad \Rightarrow \quad$ Mean $= 900 + \frac{-44}{100} \times 20 = 900 - 8.8 = 891.2$

Hence, mean wage = Rs. 891.2

Ex.2 Find the mean of the following distribution by short-cut method

Class Interval	11 – 20	21 – 30	31 – 40	41 – 50	51 – 60	61 – 70
Frequency	9	42	32	12	6	4

Sol. Let the assumed mean be A = 35.5

Class Interval	Frequency f_i	Mid-values x_i	$d_i = x_i - 35.5$	$f_1 d_1$
11 – 20	9	15.5	–20	–180
21 – 30	42	25.5	–10	–420
31 – 40	32	35.5	0	0
41 – 50	12	45.5	10	120
51 – 60	6	55.5	20	120
61 – 70	4	65.5	30	120
Total	$N= \Sigma f_i = 105$			$\Sigma f_i d_i = -240$

We have : N = 105, $\Sigma f_i d_i = -240$ and A = 35.5

$\therefore$ Mean $= \bar{x} = A + \frac{\Sigma f_i d_i}{N} = 35.5 + \left(\frac{-240}{105}\right)$

$= 35.5 - 2.29 = 33.21$

EX.3 The mean of the following frequency table is 50. But the frequencies f1 and f2 in classes 20 – 40 and 60 – 80 are missing. Find the missing frequencies.

Class Interval	0 – 20	20 – 40	40 – 60	60 – 80	80 – 100	Total
Frequency	17	f_1	32	f_2	19	120

Sol. Let the assumed mean be A = 50 and h = 20.

CALCULATION OF MEAN

Class Interval	Frequency f_i	Mid-values x_i	$u_i = \frac{x_i - 50}{20}$	$f_i u_i$
0 – 20	17	10	–2	–34
20 – 40	f_1	30	–1	$-f_1$
40 – 60	32	50	0	0
60 – 80	f_2	70	1	f_2
80 – 100	19	90	2	38
Total	$N = \Sigma f_i = 68 + f_1 + f_2$			$\Sigma f_i u_i = 4 - f_1 + f_2$

We have : $N = \Sigma f_i = 120$ [given]

$\Rightarrow \quad 68 + f_1 + f_2 = 120 \quad \Rightarrow f_1 + f_2 = 52 \quad \ldots$ (i)

Now, Mean = 50

$$\Rightarrow \quad A + h\left(\frac{1}{N}\Sigma f_i u_i\right) = 50 \quad \Rightarrow \quad 50 + 20 \times \left(\frac{4 - f_1 + f_2}{120}\right) = 150$$

$$\Rightarrow \quad 50 + \frac{4 - f_1 + f_2}{6} = 50 \quad \Rightarrow \quad \frac{4 - f_1 + f_2}{6} = 0$$

$\Rightarrow \quad 4 - f_1 + f_2 = 0 \quad \Rightarrow \quad f_1 - f_2 = 4 \quad \ldots$. (ii)

Solving (i) and (ii), we get $f_1 = 28$ and $f_2 = 24$.

Ex.4 The following table shows the age distribution of cases of certain disease admitted during a year in particular hospital.

Age in year	5 – 14	15 – 24	25 – 34	35 – 44	45 – 54	55 – 64	Total
No. of class	6	11	21	23	14	5	80

find out the mode.

Sol. Here, data is in the inclusive form.It should be converted into exclusive form.

So $\frac{L_2 - U_1}{2} = \frac{15 - 14}{2} = \frac{1}{2} = 0.5$

(here L_2 is the lower limit of second class interval and U_1 is the upper limit of first calss interval.)

Now add 0.5 to all upper limits and subtract 0.5 from all the lowers limits. And the data in exclusive form is

Age in year	4.5 – 14.5	14.5 – 24.5	24.5 – 34.5	34.5 – 44.5	44.5 – 54.5	54.5 – 64.5
No. of class	6	11	21	23	14	5

By inspection, modal class is (34.5 – 44.5)

Here $x_k = 34.5$, $h = 10$, $f_k = 23$, $f_{k-1} = 21$, $f_{k+1} = 14$.

$$\therefore \quad M_0 = x_k + h\frac{f_k - f_{k-1}}{2f_k - f_{k-1} - f_k - f_{k+1}}$$

$$M_0 = 34.5 + 10 \times \frac{23 - 21}{2 \times 23 - 21 - 14}$$

$$= 34.5 + 10 \times \frac{2}{46 - 35}$$

$$= 34.5 + 10 \times \frac{2}{11} = 34.5 + \frac{20}{11}$$

$$= \frac{379.5 + 20}{11} = \frac{399.5}{11} = 36.32$$

$\therefore M_0 = 36.32$

Ex.5 Following is the distribution of I.Q. of 100 students. Find the median I.Q.

I.Q	55–64	65–74	75–84	85–94	95–104	105–114	115–124	125–134	135–144
Frequency	1	2	9	22	33	22	8	2	1

Sol. Cumulative frequency distribution look like as below

I.Q	55–64	65–74	75–84	85–94	95–104	105–114	115–124	125–134	135–144
Frequency	1	2	9	22	33	22	8	2	1
Commulative Frequency	1	3	12	34	67	89	97	99	100

$\therefore \quad \frac{N}{2} = 50$, median class is 95 – 104.

Class have to make continuous. median class becomes (94.5 – 104.5)

Here $\ell_1 = 94.5$, $h = 10$, $c = 34$, $f = 33$.

$$\therefore \quad \text{Median} = \ell_1 + h \times \frac{\frac{N}{2} - c}{f}$$

$$= 94.5 + 10 \times \frac{50 - 34}{33}$$

$$= 94.5 + \frac{10 \times 16}{33}$$

$$= 94.5 + \frac{160}{33} = 94.5 + 4.85 = 99.35$$

Ex.6 During the medical check-up of 35 students of a class, their weights were recorded as follows **:**

Weight (in kg)	Number of students
Less than 38	0
Less than 40	3
Less than 42	5
Less than 44	9
Less than 46	14
Less than 48	28
Less than 50	32
Less than 52	35

Draw a less than type ogive for the given data. Hence obtain the median weight from the graph and verify the result by using the formula.

Ans. Draw the ogive by plotting the points :

(38, 0), (40, 3), (42, 5), (44, 9), (46, 14), (48, 28), (50, 32) and (52, 35). Here $\frac{n}{2} = 17.5$. Locate the point on the ogive whose ordinate is 17.5. The x-coordinate of this point will be the median.

Ex.7 If the median of the distribution given below is 28.5, find the values of x and y.

Expenditure (in Rs)	Frequency
0 – 10	5
10 – 20	x
20 – 30	20
30 – 40	15
40 – 50	y
50 – 60	5
Total	60

Ans. x = 8, y = 7

Ex.8 The length of 40 levels of a plant are measured correct to the nearest millimetre, and the data obtained is represented in the following table :

Length (in mm)	Number of leaves
118 – 126	3
127 – 135	5
136 – 144	9
145 – 153	12
154 – 162	5
163 – 171	4
172 – 180	2

Find the median length of the leaves.

[**Hint :** The data needs to be converted to continuous classes for finding the median, since the formula assumes continuous classes. The classes then change to 117.5 – 126.5, 126.5 – 135.5, ..., 171.5 – 180.5]

Ans. Median length = 146.75 mm

Ex.9 The distribution below gives the weights of 30 students of a class. Find the median weight of the students.

Weight (in kg)	40 – 45	45 – 50	50 – 55	55 – 60	60 – 65	65 – 70	70 – 75
Number of students	2	3	8	6	6	3	2

Ans. Median weight = 56.67 kg

Ex.10 The table below gives the percentage distribution of female teachers in the primary schools of rural areas of various states and union territories (U.T.) of India. Find the mean percentage of female teachers by all the three methods discussed in this section.

Percentage of femal teachers	15 – 25	25 – 35	35 – 45	45 – 55	55 – 65	65 – 75	75 – 85
Number of States/U.T.	6	11	7	4	4	2	1

Ans. 39.71

Ex.11 The following distribution shows the daily pocket allowance of children of a locality. The mean pocket allowance is Rs 18. Find the missing frequency f.

Daily pocket allowance (in Rs)	11 – 13	13 – 15	15 – 17	17 – 19	19 – 21	21 – 23	23 – 25
Number of children	7	6	9	12	f	5	4

Ans. f = 20

Ex.12 The table below shows the daily expenditure on food of 25 households in a locality.

Daily expenditure (in Rs)	100 – 150	150 – 200	200 – 250	250 – 300	300 – 350
Number of households	4	5	12	2	2

Find the mean daily expenditure on food by a suitable method.

Ans. Rs 211

Ex.13 To find out the concentration of SO_2 in the air (in parts per million, i.e., ppm), the data was collected for 30 localities in a certain city and is presented below :

Conentration of SO_2(in ppm)	Frequency
0.00 – 0.04	4
0.04 – 0.08	9
0.08 – 0.12	9
0.12 – 0.16	2
0.16 – 0.20	4
0.20 – 0.24	2

Find the mean concentration of SO_2 in the air.

Ans. 0.099 ppm

Ex.14 The following table give the literacy rate (in percentage) of 35 cities. Find the mean literacy rate.

Literacy rate (in %)	45 – 55	55 – 65	65 – 75	75 – 85	85 – 95
Number of cities	3	10	11	8	3

Ans. 69.43%

Ex.15 A survey conducted on 20 households in a locality by a group of students resulted in the following frequency table for the number of family members in a household :

Family size	1 – 3	3 – 5	5 – 7	7 – 9	9 – 11
Number of families	7	8	2	2	1

Find the mode of this data.

Ans. 3.286

Ex.16 The following data gives the distribution of total monthly household expenditure of 200 families of a village. Find the modal monthly expenditure of the families. Also, find the mean monthly expenditure

Expenditure (in Rs)	Number of families
1000 – 1500	24
1500 – 2000	40
2000 – 2500	33
2500 – 3000	28
3000 – 3500	30
3500 – 4000	22
4000 – 4500	16
4500 – 5000	7

Ans. Model monthly expenditure = Rs 1847.83, Mean monthly expenditure = Rs 2662.5

Ex.17 The given distribution shows the number of runs scored by some top batsmen of the world in one-day international cricket matches.

Runs scored	Number of batsmen
3000 – 4000	4
4000 – 5000	18
5000 – 6000	9
6000 – 7000	7
7000 – 8000	6
8000 – 9000	3
9000 – 10000	1
10000 – 11000	1

Find the mode of data.

Ans. Mode = 4608.7 runs

Ex.18 The median of the following data is 525. Find the values of x and y, if the total frequency is 100.

Class interval	Frequency
0 – 100	2
100 – 200	5
200 – 300	x
300 – 400	12
400 – 500	17
500 – 600	20
600 – 700	y
700 – 800	9
800 – 900	7
900 – 1000	4

Ans. x = 9, y = 15

EXERCISE - I UNSOLVED PROBLEM

Q.1 Find the mean of the following data :

Class Interval	0-8	8-16	16-24	24-32	32-40
Frequency	6	7	10	8	9

Q.2 The following distribution shows the daily pocket allowance of children of a locality. The mean pocket allowance is Rs. 18. Find the missing frequency f.

Daily pocket allowance (in Rs.)	11-13	13-15	15-17	17-19	19-21	21-23	23-25
Number of children	7	6	9	13	f	5	4

Q.3 Find the missing frequencies f_1 and f_2 in the table given below, it is being given that the mean of the given frequency distribution is 50.

Class	0-20	20-40	40-60	60-80	80-100	Total
Frequency	17	f_1	32	f_2	19	120

Q.4 The following table gives the marks scored by 100 students in a class test :

Marks	0-10	10-20	20-30	30-40	40-50	50-60
No. of Students	12	18	27	20	17	6

Find the mean marks scored by a student in class test.

Q.5 Thirty women were examined in a hospital by a doctor and the number of heart beats per minute, were recorded and summarised as follows. Find the mean heart beats per minute for these women, by using assumed-mean method.

No. of heart beats per minute	65-68	68-71	71-74	74-77	77-80	80-83	83-86
Frequency	2	4	3	8	7	4	2

Q.6 Find the mean of the following distribution by step-deviation method :

Class	50-70	70-90	90-110	110-130	130-150	150-170
Frequency	18	12	13	27	8	22

Q.7 Find the mean marks from the following data :

Marks	Below 10	Below 20	Below 30	Below 40	Below 50	Below 60	Below 70	Below 80	Below 90	Below 100
No. of Students	5	9	17	29	45	60	70	78	83	85

Q.8 Find the mean marks of students from the adjoining frequency distribution table.

Marks	**No. of Students**
Above 0	80
Above 10	77
Above 20	72
Above 30	65
Above 40	55
Above 50	43
Above 60	23
Above 70	16
Above 80	10
Above 90	8
Above 100	0

Q.9 Find the arithmetic mean of the following frequency distribution.

Class	25-29	30-34	35-39	40-44	45-49	50-54	55-59
Frequency	14	22	16	6	5	3	4

Q.10 Find the median of the following frequency distribution :

Marks	0-10	10-20	20-30	30-40	40-50	Total
No. of Students	8	20	36	24	12	100

Q.11 A life insurance agent found the following data for distribution of ages of 100 policy holders. Calculate the median age, if policies are given only to persons having age 18 years onwards but less than 60 years.

Age (in years)	Below 20	Below 25	Below 30	Below 35	Below 40	Below 45	Below 50	Below 55	Below 60
No. of policy holders	2	6	24	45	78	89	92	98	100

Q.12 The length of 40 leaves of a plant are measured correct to the nearest millimetre, and the data obtained is represented in the following table. Find the median length of the leaves.

Length (in mm)	118-126	127-135	136-144	145-153	154-162	163-171	172-180
No. of leaves	3	5	9	12	5	4	2

Q.13 Calculate the missing frequency 'a' from the following distribution, it is being given that the median of the distribution is 24.

Age (in years)	0-10	10-20	20-30	30-40	40-50
No. of persons	5	25	a	18	7

Q.14 The median of the following data is 525. Find the values of x and y, if the total frequency is 100.

Class Interval	Frequency (f_i)
0-100	2
100-200	5
200-300	x
300-400	12
400-500	17
500-600	20
600-700	y
700-800	9
800-900	7
900-1000	4
	N = 100

Q.15 The following data gives the information on the observed lifetimes (in hours) of 225 electrical components :

Lifetimes (in hours)	0-20	20-40	40-60	60-80	80-100	100-120
Frequency	10	35	52	61	38	29

Determine the modal lifetimes of the components.

Q.16 Given below is the frequency distribution of the heights of players in a school.

Heights (in cm)	160-162	163-165	166-168	169-171	172-174
No. of players	15	118	142	127	18

Find the average height of maximum number of players.

Q.17 The mode of the following series is 36. Find the missing frequency f in it.

Class	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	8	10	f	16	12	6	7

Q.18 The following distribution gives the daily income of 50 workers of a factory.

Daily income (in Rs.)	100-120	120-140	140-160	160-180	180-200
No. of workers	12	14	8	6	10

Convert the distribution above to a less than type cumulative frequency distribution and draw its ogive.

Q.19 The following table gives production yield per hectare of wheat of 100 farms of a village.

Production yield (in kg/ha)	50-55	55-60	60-65	65-70	70-75	75-80
No. of farms	2	8	12	24	38	16

Change the distribution to more than type distribution and draw its ogive.

Q.20 The annual profits earned by 30 shops of a shopping complex in a locality gives rise to the following distribution:

Profit (in lakhs Rs.)	**No. of shops (frequency)**
More than or equal to 5	30
More than or equal to 10	28
More than or equal to 15	16
More than or equal to 20	14
More than or equal to 25	10
More than or equal to 30	7
More than or equal to 35	3

Draw both ogives for the data above. Hence, obtain the median profit.

Answers

1. 21.4 **2.** f = 20 **3.** f_1 and f_2 are 28 and 24 **4.** 28 **5.** 75.9

6. 112.2 **7.** 48.41 **8.** 51.1 (approx) **9.** 36.36 (approx). **10.** 26.1

11. 35.76 **12.** 146.75 m **13.** a = 25 **14.** x and y are 9 and 15

15. 65.625 hours **16.** 165.5-168.5 **17.** f = 10

18. points (120, 12), (140, 26), (160, 34), (180, 40) and (200, 50).

19. points (50,100), (55,98), (60,90), (65,78), (70,54) and (75,16).

20. median profit is Rs. 17.5 lakhs.

EXERCISE – II BOARD PROBLEMS

Q.1 Which measure of central tendency is given by the x-coordinate of the point of intersection of the "more than ogive" and "less than ogive"? **Delhi-2008**

Q.2 Find the median class of the following data : **AI-2008**

Marks Obtained	0-10	10-20	20-30	30-40	40-50	50-60
Frequency	8	10	12	22	30	18

Q.3 Find the class marks of classes 10-25 and 35-55 : **Foreign-2008**

Q.4 Write the median class of the following distribution : **Delhi-2009**

Classes	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	4	4	8	10	12	8	4

Q.5 What is the lower limit of the modal class of the following frequency distribution? **Foreign-2009**

Age (in years)	0-10	10-20	20-30	30-40	40-50	50-60
Number of patients	16	13	6	11	27	18

Q.6 The mean of the following frequency distribution is 57.6 and the sum of observations is 50. Find the missing frequencies f_1 and f_2 : **AI-2004**

Class	0-20	20-40	40-60	60-80	80-100	100-120
Frequency	7	f_1	12	f_2	8	5

Q.7 The following table gives the distribution of expenditure of different families on education. Find the mean expenditure on education of a family : **Delhi-2004C**

Expenditure (in Rs.)	Number of families
1000-1500	24
1500-2000	40
2000-2500	33
2500-3000	28
3000-3500	30
3500-4000	22
4000-4500	16
4500-5000	7

Q.8 Find the mean of the following distribution: **Delhi-2005**

Class	4-8	8-12	12-16	16-20	20-24	24-28	28-32	32-36
Number of students	2	12	15	25	18	12	13	3

Q.9 If the mean of the following data is 18.75 find the value of p : **AI-2005**

x_i	10	15	p	25	30
f_i	5	10	7	8	2

Q.10 The Arithmetic Mean of the following frequency distribution is 50. Find the value of p : **Delhi-2006**

Class	0-20	20-40	40-60	60-80	80-100
Frequency	17	p	32	24	19

Q.11 If the mean of the following distribution is 50, find the value of f_1 : **Delhi-2006**

Class	0-20	20-40	40-60	60-80	80-100
Frequency	17	28	32	f_1	19

Q.12 The mean of the following frequency distribution is 62.8. Find the missing frequency x. **Delhi-2007**

Class	0-20	20-40	40-60	60-80	80-100	100-120
Frequency	5	8	x	12	7	8

Q.13 A survery regarding the heights (in cm) of 50 girls of class x of a school was conducted and the following data was obtained : **Delhi-2008**

Height in cm	120-130	130-140	140-150	150-160	160-170	Total
Number of girls	2	8	12	20	8	50

Find the mean, median and mode of the above data.

Q.14 Find the mean, mode and median of the following data : **AI-2008**

Class	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	5	10	18	30	20	12	5

Q.15 Find the mean, median and mode of the following data : **Foreign-2008**

Class	Frequency
0-50	2
50-100	3
100-150	5
150-200	6
200-250	5
250-300	3
300-350	1

Q.16 The following table gives the daily income of 50 workers of a factory : **Delhi-2009**

Daily income (in Rs.)	100-120	120-140	140-160	160-180	180-200
Number of workers	12	14	8	6	10

Find the mean, mode and median of the above data.

Q.17 During the medical check-up of 35 students of a class their weights were recorded as follows: **AI-2009**

Weight (in kg)	Number of students
38-40	3
40-42	2
42-44	4
44-46	5
46-48	14
48-50	4
50-52	3

Draw a less than type and a more than type ogive from the given data. Hence obtain the median weight from the graph.

Q.18 Find the mode, median and mean for the following data : **Foreign-2009**

Marks obtained	Number of students
25-35	7
35-45	31
45-55	33
55-65	17
65-75	11
75-85	1

Answers

1. Median **2.** 30-40 **3.** 17.5 and 45 **4.** 30-40 **5.** 40

6. $f_1 = 8, f_2 = 10$ **7.** Rs. 2662.5 **8.** 19.92 **9.** p = 20 **10.** p = 28

11. $f_1 = 24$ **12.** 10 **13.** Mean = 150.25 ; Median = 151.5 ; Mode = 154.

14. Mean = 35.76 ; Median = 35.66 ; Mode = 35.45

15. Mean = 59.9 ; Median = 61.6 ; Mode = 65.

16. Mean = 145.20 ; Median = 138.57 ; Mode = 125 **17.** 46.2 kg

18. Mean = 49.7 ; Median = 48.5 ; Mode = 46.1

EXERCISE – III MULTIPLE CHOICE QUESTIONS

Q.1 Which one of the following is true?

(A) $(AM)(GM) = (HM)^2$ (B) $(AM)(HM) = 2(GM)^2$

(C) $(HM)(GM) = (AM)^2$ (D) $(AM)(NM) = (GM)^2$

Q.2 A student gets marks in 7 subjects as follows:

2, 3, 4, 5, 6, 7 and 8 in these marks 5 is the

(A) mean and median (B) mean but no median

(C) median but no mean (D) mode

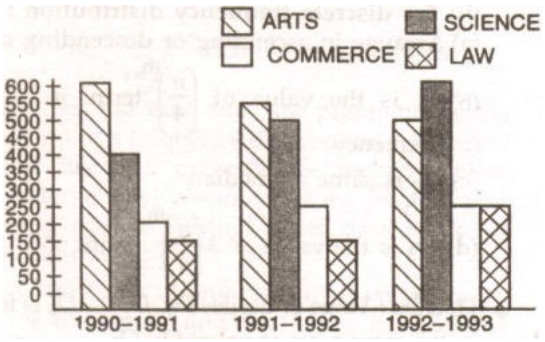
Q.3 Calculate the mode from the following table

Marks obtained	3	11	5	2	1
Frequency	2	4	3	5	7

(A) 3 (B) 1 (C) 5 (D) 4

Bar Graph (Direction Q.4 to Q. 9):

Shown below is the multiple bar diagram depicting the changes in the students strength of a college in four faculties from 1990 – 91 to 1992 – 93.



Q.4 The percentage of students in science faculty in 1990 – 91 is:

(A) 26.9% (B) 27.8% (C) 29.6% (D) 30.2%

Q.5 The percentage of students in law faculty in 1992 – 93 is:

(A) 18.5% (B) 15.6% (C) 16.7% (d) 14.8%

Q.6 How many times was the total strength of the commerce student in 1991 – 92?

(A) 3 time (B) 4 time (C) 5 time (D) 6 time

Q.7 During which year the strength of arts faculty was minimum?

(A) 1990 – 91 (B) 1991 - 92 (C) 1992 – 93 (D) none of these

Q.8 How much percent was the increase in science students in 1992 – 93 over 1990 – 91?

(A) 50% (B) 150% (C) $66\frac{2}{3}\%$ (D) 75%

Q.9 A regular decrease in student strength was in the faculty of:

(A) art (B) science (C) commerce (D) none of these

Q.10 Value of S.D. (o) of 5, 7, 9 and 11 is 2, the coefficient of variation is:

(A) 25 (B) 20 (C) 18 (D) 40

Q.11 Average grade of 10 students of a class in 50 the average grade of 20 students of a class is 60. What is the combined average of both the classes:

(A) 56.67 (B) 60.65 (C) 70 (D) 85

Q.12 Five students were tested in English and Hindi and the marks obtained by them were as under:

	A	**B**	**C**	**D**	**E**
English	55	0	82	65	75
Hindi	21	25	86	90	99

Which subject has a better median value:

(A) Hindi (B) English (C) Both (D) None of these

Q.13 Following table shows the weights of 12 students

Weight (in kgs)	67	70	72	73	75
Number of students	4	3	2	2	1

The mean weight is

(A) 70.36 (B) 70.89 (C) 70.25 (D) none of these

Q.14 Average marks secured by 10 students was 60. Later it was discovered by the teacher that the score of one student was 40 but he was missed as 50. What is the correct average of marks secured?

(A) 60 (B) 58 (C) 59 (D) 40

Q.15 Average monthly production of a factory for the first nine month is 2584 units. The average for the remaining three month of the year 2416 units. Find the average monthly production for one year.

(A) 2540 (B) 2642 (C) 2542 (D) 2740

Q.16 Following all the percentage of marks of 10 students of a class:

50, 60, 70, 72, 74, 75, 80, 88, 75, 100

Frequency of students in the class (60 – 68) will be:

(A) 5 (B) 1 (C) 6 (D) 3

Q.17 Mean of the following frequency distribution is:

Class	0-5	5-10	10-15	15-20	20-25
Frequency	2	4	8	6	10

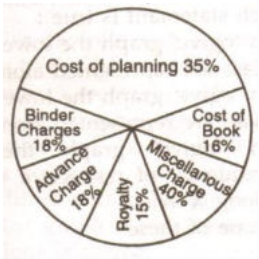
(A) 15.5 (B) 16.5 (C) 14.5 (D) 13.5

Q.18 Mean of a set of numbers is 7. Median of the some set of number is 8. What is the mode:

(A) 10 (B) 9 (C) 11 (D) 12

Circle (Direction Q.19 to Q. 23):

Graph given below shows the expenditure incurred in bringing out a book by a publisher



Q.19 What should be the central angle of the sector of the cost of the paper:

(A) (22.5)º (B) 16º (C) (54.8)º (D) (57.6)º

Q.20 If the cost of printing is Rs. 17,500 the royalty is:

(A) Rs. 8,750 (B) Rs. 7,500 (C) Rs. 3,150 (D) Rs. 6,300

Q.21 If the miscellaneous charges are Rs. 6000 the advertisement charges are:

(A) Rs. 9000 (B) Rs. 1333.33 (C) Rs. 27000 (D) Rs. 12000

Q.22 If 550 copies are published miscellaneous expenditures amount to Rs. 1848 and publisher's profit is 25% then marked price of each copy is:

(A) Rs. 8.40 (B) Rs. 12.50 (C) Rs. 10.50 (D) rs. 10

Q.23 Royalty on the book is less than the advertisement charges by:

(A) 3% (B) 20% (C) $16\frac{2}{3}$ (D) none of these

Q.24 From a frequency distribution consisting of 18 observations, the mean and the standard deviation were found to be 7 and 4 respectively. But on comparison of the original data. It was found that a figure was misread as 21 in calculation. Calculate the standard deviation.

(A) 5.5 (B) 2.5 (C) 4.5 (D) none of these

Q.25 If the width of each one of the five classes in a frequency distribution is 2 and the lower class boundary is 6. Then the upper class boundary of the highest class is:

(A) 20 (B) 15 (C) 5 (D) 10

Q.26 A histogram is a n- dimensional diagram where n is equal to:

(A) 0 (B) 1 (C) 2 (D) 3

Q.27 25^{th} percentile coincides with the:

(A) Q_1 (B) D_5 (C) P_{10} (D) Q_2

Q.28 The geometric mean of two numbers is 8 and their harmonic mean is 6.4. The numbers are:

(A) 2, 8 (B) 4, 16 (C) 6, 16 (D) 16, 8

Q.29 Calculate the mode of the following data:

Size	1	3	5	7	9
Frequency	6	9	12	3	15

(A) 9 (B) 7 (C) 5 (D) 3

Q.30 The median of the following data is:

5, 5, 4, 3, 2, 2, 2, 3, 4, 7, 8

(A) 3.5 (B) 2.5 (C) 4.5 (D) 6.5

Q.31 What is the mean of first five natural numbers?

(A) 8 (B) 10 (C) 4 (D) 3

Q.32 Mean of five items of a data is 10. If each item is multiplied by 4 then the mean will be:

(A) 40 (B) 60 (C) 50 (D) 30

Q.33 Mean of ages of 20 students is 10 years. 5 students with mean age of 12 years leave the class. Mean of ages of the remaining students will be:

(A) 4 (B) 5.66 (C) 6.25 (D) 8.33

Q.34 Mean of 5 observation 450. If the sum of four observation is equal to 30. What is the fifth observation?

(A) 225 (B) 230 (C) 500 (D) 220

Q.35 Two cricket players scored following runs in four matches which played better?

Player I — 21, 35, 40, 50

Player II — 30, 40, 50, 2

(A) Player I (B) Both (C) Player II (D) None of these

Q.36 The mean weekly pay for ten brothers equals to Rs. 100. If one of the brother gets a pay raise of Rs. 10 per week. What is the new mean?

(A) 99 (B) 200 (C) 101 (D) 250

Q.37 Given the mean (30), the mode (35). What is the median?

(A) 40 (B) 30 (C) 55.7 (D) 31.69

Q.38 A student gets the following percentages in an examination English = 50%,

Biology = 40%, Mathematics = 60%, Physics = 70%, Chemistry = 80%

It was suggested that he have been given double weightage on his marks in Physics and Chemistry than in other subjects. What is the arithmetic weightage mean of marks?

(A) 57.4 (B) 59.4 (C) 58.4 (D) 64.28

Q.39 Arithmetic mean of two numbers is 5. Their geometric mean 450. Find the number:

(A) 5, 5 (B) 6, 5 (C) 6, 6 (D) 6, 7

Q.40 Calculate the median in the following frequency distribution:

Wages	50-60	60-70	70-80	80-90	90-100
No. of labourers	5	10	15	20	25

(A) 90 (B) 70 (C) 83.75 (D) 85

Q.41 Average of 10 number is 15. Average of first six number, is 20 and that of least five number is 18. What is the sixth number?

(A) 60 (B) 70 (C) 50 (D) 80

Q.43 If the mean of n observations ax_1, ax_2, ax_3, ... ax_n is $a\bar{x}$ $(ax_1 - a\bar{x}) + (ax_2 - a\bar{x}) + (ax_3 - a\bar{x}) + ... + (ax_n - a\bar{x})$ is equal to:

(A) zero (B) one (C) 9 (D) none of these

Q.44 The mean of the squares of the first n natural numbers is:

(A) $n^2 + 1$ (B) $n^4 + 1 / 4$ (C) $\frac{(n+1)(2n+1)}{6}$ (D) $\frac{(n+1)(n+2)}{6}$

Q.45 Which statemant is true:

(A) In 'ogive' graph the lower limits of the class are represented along X-axis

(B) In 'ogive' graph the lower limits of the class are represented along X-axis

(C) In 'ogive' graph the cumulative frequency of respective class is taken along X-axis

(D) none of these

Q.46 After drawing a histogram of frequency polygon constructed by joining the consecutive ..... of top sides of each rectangle of the histogram is:

(A) left end point (B) right end point (C) mid point (D) none of these

Q.47 Data are said to be .... if the investigator himself is responsible for the collection of the data:

(A) group data (B) secondary data (C) primary data (D) all of these

Q.48 The average score of boys in an examination of a school is 71 and that of girls is 73. The average score of schools in that examination is 71.8. Find the ratio of the number of boys to the number of girls appeared in the examination.

(A) 2 : 1 (B) l : 2 (C) 3 : 2 (D) 2 : 3

Q.49 If the mean of x and 1 / x is M. The mean of x^3 and $1 / x^3$:

(A) $M\left(\frac{M^2-3}{2}\right)$ (B) $M(4M^2 - 3)$ (C) M^3 (D) $M^3 + 3$

Q.50 A diagrammic representation with the help of pictures is called:

(A) pie chart (B) ogive (C) histogram (D) none of these

Q.51 An orderly distribution of the raw data into certain specified categories is known as:

(A) frequency distribution (B) frequency

(C) cumulative frequency (D) primary data

Q.52 Consider the following statements:

I. In a bar graph, not only the height, but also each rectangle matters

II. In a bar graph, height of each rectangle matters and not its width

III. In a histogram, the height as well as the width of each rectangle matter

IV. A bar graph is two dimensional

(A) I alone is correct

(B) III alone is correct

(C) II and III are correct

(D) I and IV are correct

Q.53 What is the mean deviation:

(A) the measure of dispersion about the mean

(B) the square root of variance

(C) the measure of dispersion about the median

(D) none of these

Q.54 The difference between the maximum and the minimum observations in the data is called …….. of the data:

(A) primary (B) raw (C) range (D) limit

Q.55 The number of observations in a particular class interval is called the of the class interval:

(A) range (B) frequency (C) limit (D) lower class

Q.56 Calculate the standard deviation of the following data set

Class interval	0-4	4-8	8-12	12-16	16-20
Frequency	6	10	12	10	8

(A) 6.12 (B) 5.12 (C) 4.12 (D) 5.21

Q.57 If average of n number $x_1, x_2, \ldots x_n$ is A and x_n replace by $(n + a) x_n$ then the new average would be:

(A) (A + x) (B) $A + x_n$ (C) $\frac{(x+1)A + x_n}{n+1}$ (D) $\frac{(x+1)A + x_n}{n}$

Q.58 Calculate the median from the following data

Marks	0-10	10-20	20-30	34-40	40-50
No. of students	5	15	30	8	2

(A) 38 (B) 35 (C) 40 (D) 34

Q.59 Find the mean of 50 observation when it is given that the mean of 32 of them is 28 and the mean of the remaining 18 observation is 30:

(A) 30.24 (B) 28.72 (C) 24.82 (D) 30.32

Q.60 A factory employees 100 workers of whom 60 work is the first shift and 40 work in the second shift. The average wage of all the workers is Rs. 38. If the average wage of 60 workers in the first shift is Rs. 90. Find the average wage of the remaining 40 workers of the second shift.

(A) Rs. 35 (B) Rs. 39 (C) Rs. 40 (D) (d) Rs. 52

Q.61 Find Standard deviation for the following distribution

x	5	10	15	20	25
f	7	4	6	3	5

(A) 3.78 (B) 4.34 (C) 7.34 (D) 9.24

Q.62 The geometric mean for ungrouped data can be computed from this relationship

(A) $\log G = \frac{1}{n}\sum \log x$ (B) $\log G = n\sum \log x$

(C) $\log c = \frac{\sum f \log x}{\sum f}$ (D) none of these

Q.63 The interest paid on each of the three different sums of money yielding 1%, 2% and 4% simple interest per annum respectively is the same. The average yield percent on the total sum invested is:

(A) 2% (B) 2.33% (C) 1.71% (D) 7%

Q.64 The mean of $x_1, x_2, \ldots x_{50}$ is M. If every x_i, i = 1, 2, …. 50 is replaced by $x_i/5$ is:

(A) M (B) $M + \frac{1}{50}$ (C) 50 M (D) M/50

Q.65 The median of a distribution divides it into :

(A) two equal parts (B) three equal parts
(C) 4 equal parts (D) none of these

Q.66 The cumulative frequency of a class is always _____ that of the previous class :

(A) less than (B) less than or equal to
(C) more than (D) more than or equal to

Q.67 The correct formula for finding the median of a grouped data is :

(A) $M_e = f + \left(\frac{\frac{n}{2} - c}{l}\right) \times h$ (B) $M_e = l + \left(\frac{\frac{n}{2} - c}{f}\right) \times h$

(C) $M_e = l - \left(\frac{\frac{n}{2} + c}{l}\right) \times h$ (D) none of these

Q.68 In the formula for finding the median of a grouped frequency distribution, c stands for:

(A) lower limit of median

(B) class size

(C) frequency of median class

(D) cumulative frequency of the class preceding the median class

Q.69 Extreme values of a given data :

(A) affect the median (B) do not affect the median

(C) nothing can be said (D) none of these

Q.70 The formula of standard deviation of a grouped frequency distribution is:

(A) $\sqrt{\frac{\Sigma(x_i-\bar{x})^2}{N}}$ (B) $\frac{\Sigma(x_i-\bar{x})^2 fi}{N}$ (c) $\sqrt{\frac{\Sigma(x_i-\bar{x})^2 fi}{N}}$ (D) $\frac{\Sigma(x_1-\bar{x})^2 fi}{fi}$

Q.71 $\sqrt{x} = a + \frac{\Sigma fd}{N}$ is the formula of :

(A) median (B) mode

(C) arithmetic mean (D) mean deviation

Q.72 The arithmetic mean for the following data is:

x	35	45	55	60	75	80
f	12	18	10	6	3	11

(A) 54.08 (B) 33.87 (C) 30.67 (D) 40.48

Q.73 Calculate the median from the data:

Marks	0-10	10-30	30-60	60-80	80-90
No. of students	5	15	30	8	2

(A) 40 (B) 30 (C) 35 (D) 45

Q.74 Which of the following is true?

(A) Mean = 3 Median – 2 Mode (B) Medina = 3 Mode – 2 Mean

(C) Mode = 3 Median – 2 Mean (D) Mode = Mean + Median

Q.75 The mean of 20 items of a data is 5. If each item is multiplied by 3 then the mean will be:

(A) 20 (B) 25 (C) 12 (D) 5

Q.76 The mean of first 10 whole number is :

(A) 4.5 (B) 5.5 (C) 45 (D) 55

Q.77 The mean of 1, 2, 3, 4 …… n is given by :

(A) $\frac{n(n+1)}{2}$ (B) $\frac{(n+1)}{4}$ (C) $\frac{n}{2}$ (D) $\frac{(n+1)}{2}$

Q.78 The mean of five numbers is 10. If each number is decreased by 3, mean of the new numbers is :

(A) 13 (B) 10 (C) 7 (D) none of these

Q.79 The mean of 15 numbers is 25. If each number is multiplied by 4, mean of the new numbers is :

(A) 60 (B) 100 (C) 10 (D) none of these

Q.80 The mean of first 10 even natural numbers is

(A) 110 (B) 11 (C) 10 (D) none of these

Q.81 The symbol Σ(sigma) stands for :

(A) summation (B) multiplication (C) division (D) none of these

Q.82 In case of grouped frequency distribution with class-intervals, $\bar{x} = \frac{\sum f_i x_i}{\sum f_i}$. Here x_i stands for:

(A) lower limits (B) upper limits (C) class-marks (D) none of these

Q.83 In the formula, $\bar{x} = a + h\left(\frac{\sum f_i u_i}{\sum f_i}\right)$, h stands for :

(A) lower limit of first class (B) upper limit of first class

(C) class mark of first class (D) class-size

Q.84 The mode of the data 2, 6, 4, 5, 0, 2, 1, 3, 2, 3 is:

(A) 2 (B) 3 (C) 4 (D) 5

Q.85 Mode is :

(A) middle most value (B) least frequent value

(C) most frequent value (D) none of these

Q.86 In a grouped frequency distribution, the class with maximum frequency is called the :

(A) middle class (B) class mark (C) modal class (D) none of these

Q.87 Which of the following is not a measure of central tendency?

(A) Mean (B) Median (C) Mode (D) Ogive

Q.88 The correct formula for finding the mode of a grouped frequency distribution is :

(A) $M_0 = h + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times l$ (B) $M_0 = f_1 + \left(\frac{f_1 - f_0}{2h - f_0 - f_2}\right) \times l$

(C) $M_0 = l - \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h$ (D) $M_0 = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h$

Q.89 In the formula for finding the mode of a grouped frequency distribution, l stands for

(A) size of the class interval (B) lower limit of the modal class

(C) upper limit of the modal class (D) none of these

Q.90 Can we have two modes of a data?
(A) yes (B) no
(C) nothing can be said (D) none of these

Q.91 The median of first 10 natural numbers is :
(A) 5 (B) 6 (C) 5.5 (D) 11

Q.92 The median of first 9 whole number is :
(A) 4 (B) 5 (C) 6 (D) 4.5

Q.93 The median of first 9 natural numbers is :
(A) 4.5 (B) 4 (C) 5 (D) 6

Q.94 The correct relationship is :
(A) 3 mode = median + 2 mean (B) mean = $\frac{3\text{mode} - \text{median}}{2}$
(C) mean = $\frac{2\text{median} - \text{mode}}{3}$ (D) median = $\frac{2\text{mean} + \text{mode}}{3}$

Q.95 Can we have two medians of a data :
(A) yes (B) no
(C) nothing can be said (D) none of these

Q.96 For the distribution **[NTSE 2012]**

Marks	Number of students
Below 5	10
Below 10	25
Below 15	37
Below 20	57
Below 25	66

the sum of the lower limits of the median class and the modal class is
(A) 15 (B) 25 (C) 30 (D) 35

Q.97 Median of a data number, which has number of observations below nd above it. The median is a an equal below and of the data. 1,9,4,3,7,6,8,8,12,15, is **[NTSE 2013]**
(A) 7.5 (B) 7 (C) 8 (D) Any number between 7 and 8

Answers

1.	D	**2.**	A	**3.**	B	**4.**	C	**5.**	B	**6.**	D	**7.**	C
8.	A	**9.**	A	**10.**	A	**11.**	A	**12.**	A	**13.**	C	**14.**	C
15.	C	**16.**	B	**17.**	A	**18.**	A	**19.**	D	**20.**	B	**21.**	C
22.	C	**23.**	C	**24.**	B	**25.**	B	**26.**	B	**27.**	A	**28.**	B
29.	A	**30.**	C	**31.**	D	**32.**	A	**33.**	D	**34.**	D	**35.**	A
36.	C	**37.**	D	**38.**	D	**39.**	B	**40.**	C	**41.**	A	**42.**	B
43.	A	**44.**	C	**45.**	A	**46.**	C	**47.**	C	**48.**	C	**49.**	B
50.	D	**51.**	A	**52.**	B	**53.**	C	**54.**	C	**55.**	B	**56.**	B
57.	B	**58.**	C	**59.**	B	**60.**	A	**61.**	C	**62.**	A	**63.**	C
64.	A	**65.**	A	**66.**	D	**67.**	B	**68.**	D	**69.**	B	**70.**	C
71.	C	**72.**	A	**73.**	B	**74.**	C	**75.**	D	**76.**	A	**77.**	D
78.	C	**79.**	B	**80.**	B	**81.**	A	**82.**	C	**83.**	D	**84.**	A
85.	C	**86.**	C	**87.**	D	**88.**	D	**89.**	B	**90.**	A	**91.**	C
92.	A	**93.**	C	**94.**	D	**95.**	B	**96.**	B	**97.**	D		

PROBABILITY

INTRODUCTION

In our day-to-day conversation, we generally use the phrases like :

(i) **Probably,** Satya will visit my house today.

(ii) **Most probably,** Megha is preparing for CAT.

(iii) Khusboo is **quite sure** to be on the top.

(iv) **Chances** are high that Regi will head the organisation.

The words' probably', 'most probably', 'quite sure', 'chances' etc involve an element of uncertainty.

Probability - Probability is the mathematical measurement of uncertainty.

Probability Theory - It is that branch of mathematics in which the degree of uncertainty (or certainty of occurrence of event) is measured numerically.

SOME BASIC CONCEPTS/TERMS

1. **Experiment :** An action or operation which can produce some well defined result is known as **experiment.**

2. **Deterministic experiment :** If we perform an experiment and repeat it under identical conditions, we get almost the same result every time, such an experiment is called a **deterministic experiment.**

3. **Random experiment :** An experiment is said to be a random experiment if it satisfies the following two conditions :

(i) It has more than one possible outcomes.

(ii) It is not possible to predict the outcome (result) in advance.

Ex *(i) Tossing a pair of fair coins.* *(ii) Rolling an unbiased die.*

4. **Outcomes :** The possible results of a random experiment are called **outcomes.**

5. **Trial :** When an experiment is repeated under similar conditions and it does not give the same result each time but may result in any one of the several possible outcomes, the result is called a **trial.**

Ex *If a coin is tossed 100 times, then one toss of the coin is called a trial.*

6. **Event :** The collection of all or some outcomes of a random experiment is called an **event.**

Ex. *Suppose we toss a pair of coins simultaneously and let E be the event of getting exactly one head. Then, the even E contains HT and TH.*

Ex. *Suppose we roll a die and let E be the event of getting an even number. Then the event E contains 2, 4 and 6.*

7. **Elementary or Simple Event :** An outcome of a trial is called an **elementary event.**

NOTE : An elementary event has only one element.

Ex. *Let a pair of coins is tossed simultaneously. Then, possible outcomes of this experiment are.*

HH : Getting H on first and H on second (= E_1) [H = Head, T = Tail and E = event]

HT : Getting H on first and T on second (= E_2)

TH : Getting T on first and H on second (= E_3)

and TT : Getting T on first and T on second (= E_4)

Here, E_1, E_2, E_3 and E_4 are the elementary events associated with the random experiment of tossing of two coins.

8. **Compound event or composite event or mixed event :** An event associated to a random experiment and obtained by combining two or more simple events associated to the same random experiment, is called a **compound event.**

OR

A compound event is an aggregate of some simple (elementary) event and is decomposable into simple events.

Ex. *If we throw a die, then the event E of getting an odd number is a compound event because the event E contains three elements 1, 3 and 5, which is a compound of three simple events E_1, E_2 and E_3 containing 1, 3 and 5 respectively.*

9. Equally likely events : The out comes of an experiment are said to be equally likely events if the chances of their happenings are neither less nor greater than other.

In other words, a given number of events are said to be equally likely if none of them is expected to occur in preference to the others.

Ex. *In tossing a coin, getting head (H) and tail (T) are equally likely events.*

REVIEW:

Probability of an event: In an random experiment let S be a sample space and E ? S then E is an event. The probability of occurrence of the event E is defined as

$$P(E) = \frac{\text{number of outcomes favourable to occurrence of E}}{\text{number of all possible outcomes}}$$

$$= \frac{\text{number of distinct elements in E}}{\text{number of distinct elemnts in S}} = \frac{n(E)}{n(S)}$$

Odd is favour of an event and odds against an event.

If the number of ways in which an event can occur be m and the number of ways in which it does not occur be n then:

(i) odds in favour of the event = $\frac{m}{n}$

(ii) odds against the event = $\frac{n}{m}$

SUMMARY OF THE CHAPTER

BASIC CONCEPTS AND IMPORTANT RESULTS

*** PROBABILITY**

Probability is a measure of uncertainty.

In class IX, you studied **experimental** (or **empirical**) probability which is based on the results of actual experiments. Here, we shall be dealing with **theoretical** (or **classical**) probability. If we perform an experiment a large number of times then the experimental probability is nearly equal to the classical probability.

*** SOME TERMS RELATED TO PROBABILITY**

– Random experiment

An experiment is called ***random*** if it has more than one possible outcome and it is not possible to tell (predict) the outcome in advance.

. Sample space

The collection of all possible outcomes of an experiment is called ***sample space.***

. Occurrence of an event

When the outcome of a random experiment satisfies the condition mentioned in the event then we say that event has occurred.

For example, in the experiment of throwing a die, an event E may be taken as 'getting an even number,'. If the die comes up with any of the numbers 2, 4 or 6, we say that event E has occurred ; otherwise, if the die comes up with 1, 3 or 5, we say that event E has not occurred

. **Favourable outcomes**

The outcomes which ensure the occurrence of an event are called ***favourable outcomes*** to that event.

. **Equally likely outcomes**

If there is no reason for any one outcomes to occur in preference to any other outcome, we say that the outcomes are ***equally likely.*** For example, in tossing a (fair) coin it is equally likely that the coin lands either head up or tail up. As another example of equally likely outcomes, when we throw a (fair) die then each of the six number 1, 2, 3, 4, 5, 6 is equally likely to show up.

* **Probability (theoretical) of equally likely outcomes *Probability of an event E, written as P (E), is defined as***

$$P(E)=\frac{\text{number of outcomes favourable to E}}{\text{total number of possible outcomes}}$$

Let E be an event then the number of out comes favourable to E is greater than or equal to zero and is less than or equal to total number of outcomes. It follows that $0 \le P(E) \le 1$.

* **Sure event**

An event which always happens is called ***sure event.*** For example, when we throw a die, then the event 'getting a number less than 7' is a sure event. The probability of a sure event is 1.

* **IMPOSSIBLE EVENT**

An event which never happens is called ***Impossible event.*** For example, when we throw a die then the event 'getting a number greater than 6' is an impossible event. The probability of an impossible event is 0.

* **ELEMENTARY EVENT**

An event which has one (favourable) outcome from the sample space is called an ***elementary event.***

The sum of the probabilities of all the elementary event of an experiment is 1.

* **COMPOUND EVENT**

An event which has more than one (favourble) outcomes from the sample space is called a compound event. For example when we throw a die, then the event getting number 5 is an elementary event whereas the event getting an even number (2, 4 or 6) is a compound event.

* **COMPLEMENTARY EVENT**

If E is an event, the event of not E is complementary event of E. For example, when we throw a die, let E be the event getting a number less than or equal to 2, then the event 'not E' i.e, getting a number greater than 2 is complementary event of E.

Complement of E is denoted by $\overline{E}$ or E^c.

Let E be an event, then we have :

(i) $0 \le P(E) \le 1$ (ii) $P(\overline{E}) = 1 - P(E)$

(iii) $P(E) = 1 - P(\overline{E})$ (iv) $P(E) + P(\overline{E}) = 1$

SOLVED PROBLEMS

Ex.1 Complete the following statements :

(i) Probability of an event E + probability of the event 'not E' = ...

(ii) The probability of an event that is certain to happen is..... Such an event is called.....

(iii) The probability of an event is greater than or equal to.....and less than or equal to.....

(iv) $P(E) = \frac{\text{.....}}{\text{Total number of trials}}$

Sol. (i) 1 (ii) 1, sure or certain event

(iii) 0, 1 (iv) number of trials in which event happened.

Ex.2 Which of the following experiments have equally likely outcomes? Explain. **[NCERT]**

(i) A driver attempts to starts a car. The car starts or does not start.

(ii) A player attempts to shoot a basketball. She/he shoots or misses the shot.

(iii) A coin is tossed. It turns to be a head or a tail.

(iv) A monitor is nominated by the class teacher of a class. It is a boy or a girl.

Sol. (iii) because when a coin is tossed either a head or a tail turns.

Ex.3 Match the following:

(i)	$P(\bar{E})$ =	(a) 0
(ii)	Probability of an impossible event	(b) 0.5
(iii)	Probability of an event cannot be more than	(c) 1– P(E)
(iv)	A card is drawn from a pack of 52 cards, then the probability of getting a red card is equal to	(d) 1

Sol. (i) (c), (ii) (a), (iii) (d), (iv) (b)

Ex.4 If P(E) = 0.05, what is the probability of 'not E'? **[NCERT]**

Sol. We have P(E) = 0.05

$\therefore$ P(not E) = 1 – P(E) = 1 – 0.05 = 0.95

Therefore, P(not E) = 0.95.

Ex.5 Find the probability of getting a head when a coin is tossed once.

Sol. When a coin is tossed, then all possible outcomes are H and T

Total number of possible outcomes = 2

Let E be the event of getting a head

$\therefore$ number of favourable outcome = 1

Hence, required probability = $P(E) = \frac{\text{Number of favourable outcomes}}{\text{Total number of possible outcomes}} = \frac{1}{2}$

Ex.6 Two unbiased coins are tossed simult aneously. Find the probability of getting
(i) one head (ii) one tail (iii) two heads
(iv) at least one head (v) at most one head (vi) no head.

Sol. If two unbiased coins are tossed simultaneously, then all possible outcomes are:
HH, HT, TH, TT.
Total number of possible outcomes = 4.

(i) Let A_1 = the event of getting one head.
Then, favourable outcomes are HT, TH .
Number of favourable outcomes = 2 .

Hence, required probability = P (getting one head) = $P(A_1) = \frac{2}{4} = \frac{1}{2}$

(ii) Let A_2 = the event of getting one tail.
Then, favourable outcomes are TH, HT.
Number of favourable outcomes = 2 .

Hence, required probability = P (getting one tail) = $P(A_2) = \frac{2}{4} = \frac{1}{2}$

(iii) Let A_3 = the event of getting two heads
Then, the favourable outcome is HH
Number of favourable outcome = 1

Hence, required probability = P (getting two heads) = $P(A_3) = \frac{1}{4}$

(iv) Let A_4 = the event of getting at least one head.
Then, the favourable outcomes are HT, TH, HH
Number of favourable outcomes = 3

Hence, required probability = P (getting at least one head) = $P(A_4) = \frac{3}{4}$

(v) Let A_5 = the event of getting atmost one head.
Then, the favourable outcomes are TT, HT, TH.
Number of favourable outcomes = 3

Hence, required probability = P (getting atmost one head) = $P(A_5) = \frac{3}{4}$

(vi) Let A_6 = the event of getting no head.
Then, the favourable outcomes is TT
Number of favourable outcome = 1

Hence, required probability = P (getting one head) = $P(A_6) = \frac{1}{4}$

Ex.7 Three unbiased coins are tossed together. Find the probability of getting
(i) one head (ii) two heads (iii) all heads (iv) at least two heads

Sol. If three unbiased coins are tossed together, then all possible outcomes are :
HHH, HHT, HTH, THH, HTT, THT, TTH, TTT
Total number of possible outcomes = 8

(i) Let A_1 = the event of getting one head.
Then, the favourable outcomes are HTT, THT, TTH
Number of favourable outcomes = 3

Hence, required probability = P (getting one head) = $P(A_1) = \frac{3}{8}$

(ii) Let A_2 = the event of getting two heads.
Then, the favourable outcomes are HHT, HTH, THH.
Number of favourable outcomes = 3

Hence, required probability = P (getting two heads) = $P(A_2) = \frac{3}{8}$.

(iii) Let A_3 = event of getting all heads.
Then, the favourable outcomes is HHH
Number of favourable outcome = 1

Hence, required probability = P (getting all heads) = $P(A_3) = \frac{1}{8}$

(iv) Let A_4 = event of getting at least two heads.
Then, the favourable outcomes are HHT, HTH, THH, HHH
Number of favourable outcomes = 4

Hence, required probability = P (getting at least two heads) = $P(A_4) = \frac{4}{8} = \frac{1}{2}$

Ex.8 A die is thrown once. Find the probability of getting
(i) a prime number (ii) a number lying between 2 and 6 (iii) an odd number.

Sol. If a die is thrown, then all possible outcomes are 1, 2, 3, 4, 5, 6.
Total number of possible outcomes = 6 .

(i) Let A_1 = event of getting a prime number.
Then, the favourable outcomes are 2, 3, 5.
Number of favourable outcomes = 3

Hence, required probability = P (getting a prime number) = $P(A_1) = \frac{3}{6} = \frac{1}{2}$

(ii) Let A_2 = event of getting a number lying between 2 and 6.
Then, the favourable outcomes are 3, 4, 5.
Number of favourable outcomes = 3 .

Hence, required probability = P (getting a number lying between 2 and 6) = $P(A_2) = \frac{3}{6} = \frac{1}{2}$

(iii) Let A_3 = event of getting an odd number.
Then, the favourable outcomes are 1, 3, 5.
Number of favourable outcomes = 3 .

Hence, required probability = P (getting an odd number) = $P(A_3) = \frac{3}{6} = \frac{1}{2}$

Ex.9 A die is thrown twice. What is the probability that **[NCERT]**
(i) 5 will not come up either time? (ii) 5 will come up at least once?

Sol. If a die is thrown twice, then all the possible outcomes are:
(1, 1), (1, 2), (1, 3), (1, 4), (1, 5), (1, 6), (2, 1), (2, 2), (2, 3), (2, 4), (2, 5), (2, 6), (3, 1), (3, 2), (3, 3), (3, 4), (3, 5), (3, 6), (4, 1), (4, 2), (4, 3), (4, 4), (4, 5), (4, 6), (5, 1), (5, 2), (5, 3), (5, 4), (5, 5), (5, 6), (6, 1), (6, 2), (6, 3), (6, 4), (6, 5), (6, 6).
Total number of outcomes = 36 .

(i) Let A_1 = event of getting 5 not either time.
Then, the favourable outcomes are: (1, 1), (1, 2), (1, 3), (1, 4), (1, 6), (2, 1), (2, 2), (2, 3), (2, 4), (2, 6), (3, 1), (3, 2), (3, 3), (3, 4), (3, 6), (4, 1), (4, 2), (4, 3), (4, 4), (4, 6), (6, 1), (6, 2), (6, 3), (6, 4), (6, 6).
Number of favourable outcomes = 25

Hence, required probability = P (5 will not come up either time) = $P(A_1) = \frac{25}{36}$

(ii) Let A_2 = event of getting 5 at least once.
Then, the favourable outcomes are
(1,5),(2,5),(3,5),(4,5),(5,1),(5,2),(5,3),(5,4),(5,5),(5,6),(6,5).
Number-of favourable outcomes = 11

Hence, required probability = P (5 will come up at least once) = $P(A_2) = \frac{11}{36}$

Ex.10 A pair of dice is thrown simultaneously. Find the probability of getting

(i) a doublet

(ii) sum of the numbers on two dice is always 7

(iii) an even number on the first die and a multiple of 3 on the other.

Sol. If a pair of dice is thrown simultaneously, then all the possible outcomes are:

(1, 1), (1, 2), (1, 3), (1, 4), (1, 5), (1, 6), (2, 1), (2, 2), (2, 3), (2, 4), (2, 5), (2, 6), (3, 1), (3, 2), (3, 3), (3, 4), (3, 5), (3, 6), (4, 1), (4, 2), (4, 3), (4, 4), (4, 5), (4, 6), (5, 1), (5, 2), (5, 3), (5, 4), (5, 5), (5, 6), (6, 1), (6, 2), (6, 3), (6, 4), (6, 5), (6, 6).

Total number of possible outcomes = 36

(i) Let A_1 = event of getting a doublet.

Then, the favourable outcomes are (1,1),(2,2),(3,3),(4,4),(5,5),(6,6).

Number of favourable outcomes = 6

Here, required probability = P (getting a doublet) = $P(A_1) = \frac{6}{36} = \frac{1}{6}$

(ii) Let A_2 = event of getting a sum of the numbers on two dice is always 7.

Then, the favourable outcomes are (1,6),(2,5),(3,4),(4,3),(5,2),(6,1)

Number of favourable outcomes = 6

Here, required probability = P (getting a sum of the numbers on two dice is always 7) = $P(A_2) = \frac{6}{36} = \frac{1}{6}$

(iii) Let A_3 = event of getting an even number on the first die and a multiple of 3 on the other.

Then, the favourable outcomes are (2,3),(2,6),(4,3),(4,6),(6,3),(6,6).

Number of favourable outcomes = 6

Here, required probability = P (getting an even number on the first die and a multiple of 3 on the other)

$P(A_3) = \frac{6}{36} = \frac{1}{6}$

Ex.11 Two dice, one blue and one grey, are thrown at the same time. Write down all the possible outcomes. What is the probability that the sum of the two numbers appearing on the top of the dice is

(i) 8 (ii) 13 (iii) less than or equal to 12?

Sol. If two dice, one blue and one grey, are thrown at the same time, then all possible outcomes are:

(1, 1), (1, 2), (1, 3), (1, 4), (1, 5), (1, 6),(2, 1), (2, 2), (2, 3), (2, 4), (2, 5), (2, 6), (3, 1), (3, 2), (3, 3), (3, 4), (3, 5), (3, 6), (4, 1), (4, 2), (4, 3), (4, 4), (4, 5), (4, 6), (5, 1), (5, 2), (5, 3), (5, 4), (5, 5), (5, 6), (6, 1), (6, 2), (6, 3), (6, 4), (6, 5), (6, 6).

Total number of possible outcomes = 36

(i) Let A_1 = event of getting a sum of the two numbers appearing on the top of the dice is 8.

Then, the favourable outcomes are (2,6),(3,5),(4,4),(5,3),(6,2).

Number of favourable outcomes = 5 .

Hence, required probability = $P(A_1) = \frac{5}{36}$

(ii) Let A_2 = event of getting a sum of two numbers appearing on the top of the dice is 13.

Then, the favourable outcome = 0 .

Hence, required probability = $P(A_2) = \frac{0}{36} = 0$

(iii) Let A_3 = event of getting a sum of two numbers appearing on the top of the dice is less than or equal to 12.

Then, the favourable outcomes = all the possible outcomes = 36 .

Hence, required probability = $P(A_3) = \frac{36}{36} = 1$.

Ex.12 A card is drawn at random from a well shuffled deck of 52 cards. Find the probability that the card drawn is –

(i) a red card (ii) a non-ace (iii) a king or a jack (iv) neither a king nor a queen.

Sol. If a card is drawn at random from a well shuffled deck of 52 cards, then total number of possible outcomes = 52

(i) Let A_1 = event of getting a red card.

Then, the number of favourable outcomes = 26 .

Hence, required probability = P (getting a red card) = $P(A_1) = \frac{26}{52} = \frac{1}{2}$

(ii) Let A_2 = event of getting a non-ace.

Then, the number of favourable outcomes = 48. [$\because$ there are 4 aces in a pack of playing cards]

Hence, requird probability = P (getting a non-ace) = $\frac{48}{52} = \frac{12}{13}$

(iii) Let A_3 = event of getting a king or a jack

There are 4 king cards and 4 jack cards.

Hence, required probability = $P(A_3)$ = P (getting a king or a jack) = P (getting a king) + P (getting a jack)

$= \frac{4}{52} + \frac{4}{52} = \frac{8}{52} = \frac{2}{13}$

(iv) Let A_4 = event of getting neither a king nor a queen.

There are 4 king and 4 queen cards.

Hence, required probability = $P(A_4)$ = P (getting neither a king nor a queen)

= 1 – P (getting a king or a queen)

= 1 – [P (getting a king) + P (getting a queen)]

$= 1 - \left(\frac{4}{52} + \frac{4}{52}\right) = 1 - \frac{8}{52} = \frac{44}{52} = \frac{11}{13}$

ALITER: Let A_4 : event of getting neither king nor queen.

There are 4 king and 4 queen cards.

$\therefore$ no. of favourable outcomes,

i.e., neither king nor queen cards = 52 – 8 = 44

Hence, $P(A_4) = \frac{44}{52} = \frac{11}{13}$

Ex.13 All the three face cards of spades are removed from a well-shuffled pack of 52 cards. A card is then drawn at random from the remaining pack. Find the probability of getting

(i) a black face card (ii) a queen (iii) a black card

Sol. If all the three face cards of spades are removed from a well-shuffled pack of 52 cards, then there are 49 cards left in the pack.

(i) Let A_1 = event of getting a black face card.

There are 3 black face cards left. (face cards of club)

Hence, required probability = $P(A_1)$ = P (getting a black face card) = $\frac{3}{49}$

(ii) Let A_2 = event of getting a queen.

There are three queens left.

Hence, required probability = $P(A_2)$ = P (getting a queen) = $\frac{3}{49}$

(iii) Let A_3 = event of getting a black card.

There are 23 black cards left.

Hence, required probability = $P(A_3)$ = P (getting a black card) = $\frac{23}{49}$

Ex.14 Five cards, the- ten, jack, queen, king and ace of diamonds, are well-shuffled with their faces downwards. One card is then picked up at random.

(i) What is the probability that the card is the queen?

(ii) If the queen is drawn and put aside, what is the probability that the second card picked up is (a) an ace? (b) a queen?

Sol. There are five cards as the ten, jack, queen, king and ace of diamond.

(i) Let A = event of getting a queen.

There is only one queen out of the five cards.

Hence, required probability = P(A) = P (getting a queen) = $\frac{1}{5}$

(ii) When a queen is drawn and put aside four cards, the ten, jack, king and ace are left. Therefore,

(a) required probability =P(getting an ace)= $\frac{1}{4}$

(b) required probability

= P(getting a queen)= $\frac{0}{4}$ = 0.

Ex.15 A box contains 5 red, 4 green and 7 white balls. A ball is drawn at random from the box. Find the probability that the ball drawn is

(i) white (ii) neither red nor white

Sol. Total number of balls in the box = 5 + 4 + 7 = 16.

Let A_1 = event of getting a red ball

A_2 = event of getting a white ball.

(i) There are 7 white balls in the box.

Hence, required probability = $P(A_2)$ = P (getting a white ball) = $\frac{7}{16}$

(ii) There are 7 white and 5 red balls in the box.

Hence, required probability = P (getting neither red nor white ball)

= 1 – P (getting either red or white ball)

= 1 – (P (getting a red ball) + P (getting a white ball)]

$=1-\left(\frac{5}{16}+\frac{7}{16}\right)=1-\frac{12}{16}=\frac{4}{16}=\frac{1}{4}$

ALITER P(getting neither red nor white ball) = P (getting a green ball) = $\frac{4}{16}=\frac{1}{4}$

Ex.16 A bag contains 5 red balls and some blue balls. If the probability of drawing a blue ball is double that of red ball, determine the number of blue balls in the bag.

Sol. There are 5 red balls in a bag.

Let number of blue balls be x.

Let A_1 = event of getting a red ball

and A_2 = event of getting a blue ball.

$P(A_1)$ = P (getting a red ball) = $\frac{5}{x+5}$

$P(A_2)$ = P (getting a blue ball) = $\frac{x}{x+5}$

$\because$ $2P(A_1) = P(A_2)$ $\Rightarrow$ $\frac{2\times5}{x+5}=\frac{x}{x+5}$

$\Rightarrow$ $10 = x$ $\Rightarrow$ $x = 10$

Hence, required number of blue balls = 10.

Ex.17 A box contains 5 red marbles, 8 white marbles and 4 green marbles one marble is taken out of the box at random. What is the probability that the marble taken out will be **[NCERT]**

(i) red (ii) white (iii) not green?

Sol. Total number of marbles in the box = 5+8+4 = 17.

Let A_1 = event of getting a red marble,

A_2 = event of getting a white marble

and A_3 = event of getting a green marble.

(i) There are 5 red marbles in the box.

Hence, required probability = $P(A_1)$ = P (getting a red marble) = $\frac{5}{17}$

(ii) There are 8 white marbles in the box.

Hence, required probability = $P(A_2)$ = P (getting a white marble) = $\frac{8}{17}$

(iii) There are 4 green marbles in the box.

$\therefore$ $P(A_3)$ = P(getting a green marble) = $\frac{4}{17}$

Hence, required probability = P (not getting a green marble)

= 1 – P (getting a green marble) = 1 – $P(A_3)$ = $1-\frac{4}{17}=\frac{13}{17}$.

Ex.18 A box contains 19 balls bearing numbers 1, 2, 3,.....,19 respectively. A ball is drawn at random from the box. Find the probability that the number on the ball is –

(i) a prime number (ii) even number

(iii) divisible by 3 or 5 (iv) neither divisible by 5 nor by 10.

Sol. Total number of balls in the box = 19

$\therefore$ number of all possible outcomes = 19

(i) Let A_1 = event of getting a prime number.

Then, the favourable outcomes are 2, 3, 5, 7, 11, 13, 17, 19.

Number of favourable outcomes = 8 .

Hence, required probability = P (getting a prime number) = $P(A_1) = \frac{8}{19}$.

(ii) Let A_2 = event of getting an even number.

Then, the favourable outcomes are 2, 4, 6, 8, 10, 12, 14, 16, 18.

Number of favourable outcomes = 9 .

Hence, required probability = P (getting an even number) = $P(A_2) = \frac{9}{19}$.

(iii) Let A_3 = event of getting a number divisible by 3 or 5.

Then, the favourable outcomes are 3, 5, 6, 9, 10, 12, 15, 18.

Number of favourable outcomes = 8 .

Hence, required probability = P (getting a number divisible by 3 or 5) = $P(A_3) = \frac{8}{19}$

(iv) Let A_4 = event of getting a number divisible by 5 or 10.

Then, the favourable outcomes are 5, 10, 15. Number of favourable outcomes = 3 .

$\therefore$ P (getting a number divisible by 5 or 10) = $P(A_4) = \frac{3}{19}$

Hence, required probability = P (getting a number neither divisible by 5 nor by 10)

= 1 – P (getting a number either divisible by 5 or 10) = $1 - \frac{3}{19} = \frac{16}{19}$

Ex.19 Seventeen cards numbered 1, 2, 3, 4,.....,16, 17 are put in a box and mixed thoroughly. One person draws a card from the box. Find the probability that the number on the card is

(i) odd (ii) a prime (iii) divisible by 3 (iv) divisible by 2 and 3 both

Sol. There are seventeen cards in the box.

$\therefore$ number of all possible outcomes = 17.

(i) Let A_1 = event of getting an odd number.

Then, the favourable outcomes are 1, 3, 5, 7, 9, 11, 13, 15, 17.

Number of favourable outcomes = 9.

Hence, the required probability = P (getting an odd number) = $P(A_1) = \frac{9}{17}$

(ii) Let A_2 = event of getting a prime number.

Then, the favourable outcomes are 2, 3, 5, 7, 11, 13, 17.

Number of favourable outcomes = 7

Hence, the required probability = P (getting a prime number) = $P(A_2) = \frac{7}{17}$

(iii) Let A_3 = event of getting a number divisible by 3.

Then, the favourable outcomes are 3, 6, 9, 12, 15.

Number of favourable outcomes = 5.

Hence, the required probability = $P(A_3) = \frac{5}{17}$

(iv) Let A_4 = event of getting a number divisible by 2 and 3 both.

Then, the favourable outcomes are 6, 12.

Number of favourable outcomes = 2.

Hence, required probability = $P(A_4) = \frac{2}{17}$

Ex.20 Find the probability that a number selected at random from the numbers 1 to 25 not a prime number when each of the given numbers is equally likely to be selected.

Sol. The total given numbers = 25

Then, the favourable outcomes (prime numbers) are 2, 3, 5, 7, 11, 13, 17, 19, 23.

Number of favourable outcomes = 9

Let A = event of getting a non-prime number.

$\therefore$ number of non-prime number = 25 – 9 = 16

$\therefore$ required probability = P (getting a non-prime numbers) = P(A) = $\frac{16}{25}$.

Ex.21 A box contains 90 discs which are numbered from 1 to 90. If one disc is drawn at random from the box, find the probability that it bears **[NCERT]**

(i) a two digit number (ii) a perfect square number (iii) a number divisible by 5.

Sol. The total number of discs = 90. Number of possible outcomes = 90.

(i) Let A_1 = event of getting a two digit number.

There are 9 single-digit numbers and 81 two-digit numbers.

Then, the number of favourable outcomes = 81.

Hence, required probability = P(A_1) = P (getting a two-digit number) = $\frac{81}{90} = \frac{9}{10}$.

(ii) Let A_2 = event of getting a perfect square number.

Then, the favourable outcomes are 1, 4, 9, 16, 25, 36, 49, 64, 81.

Number of favourable outcomes = 9 .

Hence, required probability = P(A_2) = P (getting a perfect square number) = $\frac{9}{90} = \frac{1}{10}$

(iii) Let A_3 = event of getting a number divisible by 5.

Then, the favourable outcomes are 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90.

Number of favourable outcomes = 18 .

Hence, required probability = P(A_3) = P (getting a number divisible by 5) = $\frac{18}{90} = \frac{1}{5}$

Ex.22 12 defective pens are accidentally mixed with 132 good ones. It is not possible to just look at a pen and tell whether or not is defective. One pen is taken out at random from this lot. Determine the probability that the pen taken out is a good one. **[NCERT]**

Sol. There are 12 defective pens and 132 good pens.

$\therefore$ Total number of possible outcomes = 12 + 132 = 144.

Let A = event of getting a good pen

Then, the number of favourable outcomes = 132

Hence, required probability = P(A) = P (getting a good pen) = $\frac{132}{144} = \frac{11}{12}$.

Ex.23 A lot consists of 144 ball pens of which 20 are defective and the others are good. Nuri will buy a pen if it is good, but will not buy if it is defective. The shopkeeper draws one pen at random and gives it to her. What is the probability that (i) she will buy it (ii) she will not buy it?

Sol. There are 144 ball pens.

$\therefore$ total number of possible outcomes = 144.

(i) Let A_1 = event of buying a good pen.

There are 20 ball pens which are defective out of 144 ball pens.

$\therefore$ number of good ball pens = 144 – 20 = 124

Hence, the required probability = P(A_1) = P (buying a good pen) = $\frac{124}{144} = \frac{31}{36}$

(ii) Let A_2 = event of not buying a good pen, i.e. buying a defective pen.

Then, the number of favourable outcomes = 20.

Hence, required probability = P(A_2) = P (not buying a good pen) = $\frac{20}{144} = \frac{5}{36}$

Ex.24 Savita and Hamida are friends. What is the probability that both will have **[NCERT]**
(i) different birthdays
(ii) the same birthday (ignoring leap year).

Sol. There are 365 days in a year.
$\therefore$ the total number of possible outcomes = 365.

(i) Let A_1 = the event that Hamida's birthday is different from Savita's birthday Then, the number of favourable outcomes for her birthday = 365 – 1 = 364.
Hence, the required probability = $P(A_1)$ = P (Hamida' s birthday is different from Savita's birthday) = $\frac{364}{365}$

(ii) Let A_2 = the event that Savita and Hamida have the same birthday.
Hence, the required probability = $P(A_2)$ = P (Savita and Hamida have the same birthday)
= 1 – P (both have different birthday) = $1 - \frac{364}{365} = \frac{1}{365}$

Ex.25 A jar contains 24 marbles, some are green and others are blue. If a marble is drawn at random from the jar, the probability that is green is $\frac{2}{3}$. Find the number of blue marbles in the jar.

Sol. There are 24 marbles in a jar.
$\therefore$ the total number of possible outcomes = 24.
Let number of green marbles be x.
Let A_1 = event of getting a green marble.
$\therefore$ required probability = $P(A_1)$ = P (getting a green marble) = $\frac{x}{24}$
But it is given that the probability of green marble is $\frac{2}{3}$

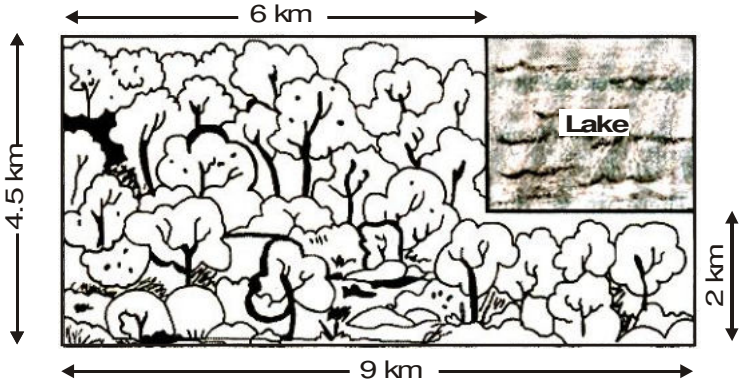
$\therefore \quad \frac{2}{3} = \frac{x}{24} \Rightarrow x = \frac{2 \times 24}{3} \Rightarrow x = 16$

So, number of green marbles = 16.
Hence, number of blue marbles in jar = 24 – 16 = 8.

Ex.26 What is the probability that an ordinary year has 53 sundays?

Sol. There are 365 days i.e., 52 weeks and 1 day in an ordinary year.
This 1 day can be anyone of the 7 days of the week.
$\therefore$ P (this day is sunday) = $\frac{1}{7}$
Also, 52 weeks have 52 sundays.
Hence, required probability = P (an ordinary year has 53 sundays) = $\frac{1}{7}$

Ex.27 A missing helicopter is reported to have crashed somewhere in the rectangular region in figure. What is the probability that it crashed inside the lake shown in the figure? **[NCERT]**



Sol. The helicopter is equally likely to crash anywhere in the region.
Area of entire rectangular region, where the helicopter can crash = (4.5 × 9) km^2 = 40.5 km^2.
Area of the lake =(2.5 × 3) km^2 = 7.5 km^2
Let A = the event that the helicopter crashed inside the lake.
Then, number of favourable outcomes = 7.5 km^2
Hence, required probability = P(A) = P (helicopter crashed in the lake)
$= \frac{7.5}{40.5} = \frac{75}{405} = \frac{5}{27}$.

Ex.28 A piggy bank contains hundred 50p coins, fifty Re. 1 coins, twenty Rs. 2 coins and ten Rs. 5 coins. If it is likely that one of the coins will fall out when the bank is turned upside down, what is the probability that the coin **[NCERT]**

(i) will be a 50p coin (ii) will not be a Rs. 5 coin?

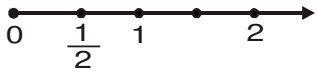
Sol. Number of 50p coins = 100
Number of Re. 1 coins = 50
Number of Rs. 2 coins = 20
Number of Rs. 5 coins = 10
$\therefore$ total number of coins = 180
$\therefore$ the number of possible outcomes = 180.

(i) Let A_1 = event of getting 50p coin.
Then, the number of favourable outcomes = 100.
Hence, required probability = $P(A_1)$ = P (getting a 50p coin) = $\frac{100}{180}=\frac{5}{9}$

(ii) Let A_2 = event of getting not a Rs. 5 coin.
Hence, required probability = $P(A_2)$ = P (not getting Rs. 5 coin)
= 1 – P (getting a Rs. 5 coin)
= $1 - \frac{10}{180}=\frac{170}{180}=\frac{17}{18}$

Ex.29 In a musical chair game, the person playing the music has been advised to stop playing the music at any time within two minutes after she/he starts playing. What is the probability that the music will stop within the first half minute after starting? **[NCERT]**

Sol. The possible outcomes are all the numbers between 0 and 2.
This is the portion of the number line from 0 to 2.



Let A = the event that the music is stopped within the first half-minute.

Then, the favourable outcomes are points on the number line from 0 to $\frac{1}{2}$

The distance from 0 to 2 is 2, while the distance from 0 to $\frac{1}{2}$ is $\frac{1}{2}$

Since all the outcomes are equally likely, therefore, the total distance = 2 and distance favourable to A = $\frac{1}{2}$.

Hence, required probability = P(A) = P (the music is stopped within the first half minute) = $\frac{\frac{1}{2}}{2}=\frac{1}{4}$

Ex.30 There are 40 students in class X of a school of whom 25 are girls and 15 are boys. The class teacher has to select one student as a class representative. She writes the name of each student on a separate card, the cards being identical. Then she puts cards in a bag and stir them thoroughly. She, then draws one card from the bag. What is the probability that the name written on the card is the name of : (i) a girl (ii) a boy? **[NCERT]**

Sol. There are 40 students out of which 25 are girls and 15 are boys.
$\therefore$ the number of all possible outcomes = 40.

(i) Let A_1 = event that the name written on the card is the name of a girl.
Then, the number of favourable outcomes = 25 .
Hence, required probability = $P(A_1) = \frac{25}{40}=\frac{5}{8}$

(ii) Let A_2 = event that the name written on the card is the name of a boy.
Then, the number of favourable outcomes = 15.
Hence, required probability = $P(A_2) = \frac{15}{40}=\frac{3}{8}$.

EXERCISE – I UNSOLVED PROBLEMS

Q.1 A bag contains mango flavoured candies only. Renu takes out one candy without looking into the bag. What is the probability that she takes out

(i) an orange flavoured candy ?
(ii) a mango flavoured candy ?

Q.2 A bag contains a red ball, a blue ball and a yellow ball, all the balls being of the same size. Anjali takes out a ball from the bag without looking into it. What is the probability that she takes out

(i) yellow ball ? (ii) red ball ? (iii) blue ball ?

Q.3 Two players, Sania and Sonali, play a tennis match .It is known that the probability of Sania winning the match is 0.62. What is the probability of Sonali winning ?

Q.4 It is given that in a group of 3 students, the probability of 2 students not having the same birthday is 0.992. What is the probability that the 2 students have the same birthday ?

Q.5 A bag contains 3 red balls and 5 black balls. A ball is drawn at random from the bag. What is the probability that the ball drawn is (i) red ? (ii) not red?

Q.6 Malini buys a fish from a shop for her aquarium. The shopkeeper takes out one fish at random from a tank containing 5 male fish and 8 female fish. What is the probability that the fish taken out is male fish ?

Q.7 Out of 400 bulbs in a box, 15 bulbs are defective. One bulb is taken out at random from the box. Find the probability that the drawn bulb is not defective.

Q.8 A box contains 3 blue, 2 white and 4 red marbles. If a marble is drawn at random from the box, what is the probability that it will be

(i) white ? (ii) blue ? (iii) red ?

Q.9 A bag contains 7 black, 5 red and 3 white balls. A ball is drawn from the bag at random. Find the probability that the ball drawn is

(i) red (ii) black or white
(iii) not black.

Q.10 A bag contain 5 red, 8 white and 7 black balls. A ball is drawn from the bag at random. Find the probability that the drawn ball is

(i) red or white (ii) not black
(iii) neither white nor black

Q.11 If 65% of the population have black eyes, 25% have brown eyes and the remaining have blue eyes, what is the probability that a person selected at random has

(i) blue eyes (ii) brown or black eyes
(iii) neither blue nor brown eyes ?

Q.12 A bag contains 5 white balls, 7 red balls, 4 black balls and 2 blue balls. One ball is drawn at random from the bag. What is the probability that the ball drawn is :

(i) white or blue (ii) not white
(iii) neither white nor black ?

Q.13 A piggy bank contains one hundred Re 1 coins, fifty Rs.2 coins, twenty Rs 5 coins and ten Rs. 10 coins. If it is equally likely that one of the coins will fall out when the bank is turned upside down, what is the probability that the coin

(i) will be a Rs 1 coin ?
(ii) will not be a Rs 10 coin ?

Q.14 A carton consists of 100 shirts of which 88 are good, 8 have minor defects and 4 have major defects. Peter, a trader, will only accept the shirts which are good, but Salim another trader, will only reject the shirts which have major defects. One shirt is drawn at random from the carton. What is the probability that

(i) it is acceptable to Peter ?
(ii) it is acceptable to Salim ?

Q.15 (i) A lot of 20 bulbs contains 4 defective ones. One bulb is drawn at random from the lot. What is the probability that this bulb is defective ?

(ii) Suppose the bulb drawn in (i) is not defective and is not replaced. Now one bulb is drawn at random from the rest. What is the probability that this bulb is not defective ?

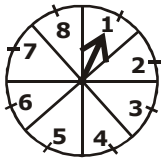
Q.16 A box contains 150 apples. If an apple is taken out from the box at random and the probability of its being rotten is 0.06 then find the number of good apples in the box.

Q.17 A letter is chosen from the word 'TRIANGLE'. What is the probability that it is a vowel ?

Q.18 In a single throw of a die, what is the probability
(i) getting a number greater than 4 ?
(ii) getting a number less than or equal to 4 ?
(iii) getting a number greater than 6 ?

Q.19 In a single throw of a die, find the probability of getting
(i) a prime number
(ii) a number lying between 2 and 6
(iii) an odd number
(iv) a number divisible by 2 or 3

Q.20 A game of chance consists of spinning an arrow which comes to rest pointing at one of the numbers 1, 2, 3, 4, 5, 6, 7, 8, (shown in the adjoining figure) and these are equally likely outcomes. What is the probability that it will point at



(i) 8 ?
(ii) an odd number ?
(iii) a number greater than 2 ?
(iv) a number less than 9 ?

Q.21 A bag contains 4 red balls and 3 black balls. What is the sample space if the experiment consists of drawing 1 ball from the bag.

Q.22 One card is drawn from a pack of 52 cards, each of the 52 cards being equally likely to be drawn. Find the probability of
(i) the card drawn is red
(ii) the card drawn in a King
(iii) the card drawn is red and a King.

Q.23 A die is thrown once. Find the probability of getting (i) an even number (ii) a prime number (iii) a number greater than 4.

Q.24 Two unbiased coins are tossed once. What is the probability of getting exactly one head

Q.25 In a single throw of two dice, find the probability of getting :
(i) a total of 7 (ii) a total of 11
(iii) doublets (iv) six as a product.

Q.26 Three unbiased coins are tossed. What is the probability of getting (i) two heads (ii) at least two heads (iii) at most two heads (iv) one head or two heads ?

ANSWER KEY

1. (i) 0 (ii) 1 **2.** (i) $\frac{1}{3}$ (ii) $\frac{1}{3}$ (iii) $\frac{1}{3}$

3. 0.38 **4.** 0.008

5. (i) $\frac{3}{8}$ (ii) $\frac{5}{8}$ **6.** $\frac{5}{13}$

7. $\frac{77}{80}$ **8.** (i) $\frac{2}{9}$ (ii) $\frac{1}{3}$ (iii) $\frac{4}{9}$

9. (i) $\frac{1}{3}$ (ii) $\frac{2}{3}$ (iii) $\frac{8}{15}$

10. (i) $\frac{13}{20}$ (ii) $\frac{13}{20}$ (iii) $\frac{1}{4}$

11. (i) $\frac{1}{10}$ (ii) $\frac{9}{10}$ (iii) $\frac{13}{20}$

12. (i) $\frac{7}{18}$ (ii) $\frac{13}{18}$ (iii) $\frac{1}{2}$

13. (i) $\frac{5}{9}$ (ii) $\frac{17}{18}$ **14.** (i) $\frac{22}{25}$ (ii) $\frac{24}{25}$

15. (i) $\frac{1}{5}$ (ii) $\frac{15}{19}$ **16.** 141

17. $\frac{3}{8}$ **18.** (i) $\frac{1}{3}$ (ii) $\frac{2}{3}$ (iii) 0

19. (i) $\frac{1}{2}$ (ii) $\frac{1}{2}$ (iii) $\frac{1}{2}$ (iv) $\frac{2}{3}$

20. (i) $\frac{1}{8}$ (ii) $\frac{1}{2}$ (iii) $\frac{3}{4}$ (iv) 1

21. $S = \{R_1, R_2, R_3, R_4, B_1, B_2, B_3\}$.

22. (i) $\frac{1}{2}$ (ii) $\frac{1}{13}$ (iii) $\frac{1}{26}$

23. (i) $\frac{1}{2}$ (ii) $\frac{1}{2}$ (iii) $\frac{1}{3}$

24. $\frac{1}{2}$ **25.** (i) $\frac{1}{6}$ (ii) $\frac{1}{18}$ (iii) $\frac{1}{6}$ (iv) $\frac{1}{9}$

26. (i) $\frac{3}{8}$ (ii) $\frac{1}{2}$ (iii) $\frac{7}{8}$ (iv) $\frac{3}{4}$

EXERCISE – II BOARD PROBLEMS

Q.1 From a well shuffled pack of cards, a card is drawn at random. Find the probability of getting a black queen. **[Delhi-2008]**

Q.2 A bag contains 4 red and 6 black balls. A ball is taken out of the bag at random. Find the probability of getting a black ball. **[AI-2008]**

Q.3 A die is thrown once. Find the probability of getting a number less than 3. **[Foreign-2008]**

Q.4 Cards bearing numbers 3 to 20 are placed in a bag and mixed thoroughly. A card is taken out from the bag at random. What is the probability that the number on the card taken out is an even number? **[Delhi-2008 C]**

Q.5 Two friends were born in the year 2000. What is the probability that they have the same birthday? **[AI-2008 C]**

OR

Two coins are tossed simultaneously. Find the probability of getting exactly one head. **[AI-2008]**

Q.6 A die is thrown once. Find the probability of getting : **[Delhi-2008]**

(i) A prime number

(ii) A number divisible by 2.

Q.7 Cards, marked with numbers 5 to 50, are placed in a box and mixed throughly. A card is drawn from the box at random. Find the probability that the number on the taken card is :

(i) A prime number less than 10. **[AI-2008]**

(ii) A number which is a perfect square

Q.8 A pair of dice is thrown once. Find the probability of getting the same number on each dice. **[Foreign-2008]**

Q.9 A bag contains 5 red, 4 blue and 3 green balls. A ball is taken out of the bag at random. Find the probability that the selected ball is (i) of red colour (ii) not of green colour.

OR

A card is drawn at random from a well-shuffled deck of playing cards. Find the probability of drawing a (i) face card (ii) card which is neither a king nor a red card. **[Delhi-2008 C]**

Q.10 Two dice are thrown simultaneously. Find the probability that the sum of the two numbers appearing on the top is less than or equal to 10.

OR

The king, queen and jack of diamonds are removed from a pack of 52 cards and then the pack is well shuffled. A card is drawn from the remaining cards. Find the probability of getting a card of (i) diamonds (ii) a jack. **[AI-2008C]**

Q.11 A bag contains 5 black, 7 red and 3 white balls. A ball is drawn from the bag at random. Find the probability that the ball drawn is (i) red (ii) black or white (iii) not black. **[Delhi-2004]**

Q.12 A bag contains 7 black, 5 red and 3 white balls. A ball is drawn from the bag at random. Find the probability that the ball drawn is (i) red (ii) black or white (iii) not black. **[Delhi-2004]**

Q.13 A bag contains 6 black, 7 red and 2 white balls. A ball is drawn from the bag at random. Find the probability that the ball drawn is (i) red (ii) black or white (iii) not black. **[Delhi-2004]**

Q.14 A bag contains 4 red, 5 black and 6 white balls. A ball is drawn from the bag at random. Find the probability that the ball drawn is (i) white (ii) red (iii) not black (iv) red or white. **[AI-2004]**

Q.15 A bag contains 4 red, 5 black and 6 white balls. A ball is drawn from the bag at random. Find the probability that the ball drawn is (i) white (ii) red (iii) not black (iv) red or white. **[AI-2004]**

Q.16 A bag contains 3 red, 5 black and 7 white balls. A ball is drawn from the bag at random. Find the probability that the ball drawn is (i) white (ii) red (iii) not black (iv) red or white. **[AI-2004]**

Q.17 A bag contains 6 red, 5 black and 4 white balls. A ball is drawn from the bag at random. Find the probability that the ball drawn is (i) white (ii) red (iii) not black (iv) red or white. **[AI-2004]**

Q.18 15 cards, numbered 1, 2, 3, ..., 15 are put in a box and mixed thoroughly. A card is drawn at random from the box. Find the probability that the card drawn bears (i) an even number (ii) a number divisible by 2 or 3. **[Foreign-2004]**

Q.19 A card is drawn at random from a pack of 52 playing cards. Find the probability that the card drawn is neither an ace nor a king. **[Delhi-2004C]**

Q.20 Out of 400 bulbs in a box, 15 bulbs are defective. One bulb is taken out at random from the box. Find the probability that the drawn bulb is not defective.

OR

Find the probability of getting 53 Fridays in a leap year. **[AI-2004 C]**

Q.21 A bag contains 8 red, 6 white and 4 black balls. A ball is drawn at random from the bag. Find the probability that the drawn ball is : (i) red or white (ii) not black (iii) neither white nor black. **[AI-2005]**

Q.22 A bag contains 5 white balls, 7 red balls, 4 black balls and 2 blue balls. One ball is drawn at random from the bag. What is the probability that the ball drawn is :

(i) white or blue (ii) red or black (iii) not white (iv) neither white nor black. **[Delhi-2006]**

Q.23 A card is drawn at random from a well shuffled deck of playing cards. Find the probability that the card drawn is : (i) a king or a jack (ii) a non ace (iii) a red card (iv) neither a king nor a queen. **[Delhi-2006]**

Q.24 A card is drawn at random from a well-shuffled deck of playing cards. Find the probability that the card drawn is : (i) a card of spade or an ace (ii) a red king (iii) neither a king nor a queen (iv) either a king or queen. **[Delhi-2006]**

Q.25 A box contains 19 balls bearing numbers 1, 2, 3, ..., 19. A ball is drawn at random from the box. What is the probability that the number of the ball is (i) a prime number (ii) divisible by 3 or 5 (iii) neither divisible by 5 nor by 10 (iv) an even number. **[Delhi-2006]**

Q.26 Find the probability that a number selected at random from the numbers 1, 2, 3, ..., 35 is a (i) prime number (ii) multiple of 7 (iii) multiple of 3 or 5. **[Delhi-2006C]**

Q.27 From a pack of 52 playing cards, jacks, queens, kings and aces of red colour are removed. From the remaining cards, a card is drawn at random. Find the probability that the card drawn is : (i) a black queen (ii) a red card (iii) a black jack (iv) a picture card (jacks, queens and kings are picture cards). **[AI-2006C]**

Q.28 Cards marked with numbers 3, 4, 5, ..., 50 are placed in a box and mixed thoroughly. One cards is drawn at random from the box. Find the probability that number on the drawn card is (i) divisible by 7 (ii) a number which is a perfect square. **[Delhi-2007]**

Q.29 A bag contains 5 red balls and some blue balls. If the probability of drawing a blue ball from the bag is thrice that of a red ball, find the number of blue balls in the bag. **[Delhi-2007]**

Q.30 A box contains 5 red balls, 4 green balls and 7 white balls. A ball is drawn at random from the box. Find the probability that the ball drawn is : (i) white (ii) neither red nor white. **[AI-2007]**

Q.31 All the three face cards of spades are removed from a well-shuffled pack of 52 cards. A card is then drawn at random from the remaining pack. Find the probability of getting (i) a black face card (ii) a queen (iii) a black card. **[AI-2007]**

Q.32 The king, queen and jack of clubs are removed from a deck of 52 playing cards and the remaining cards are shuffled. A card is drawn from the remaining cards. Find the probability of getting a card of (i) heart (ii) queen (iii) clubs. **[Delhi-2009]**

Q.33 Two dice are thrown simultaneously. What is the probability that

(i) 5 will not come up on either of them?

(ii) 5 will come up on at least one?

(iii) 5 will come up at both dice? **[AI-2009]**

OR

A box has cards numbered 14 to 99. Cards are mixed throughly and a card is drawn from the bag at random. Find the probability that the number on the card, drawn from the box is :

(i) an odd number

(ii) a perfect square number

(iii) a number divisible by 7. **[Foreign-2009]**

ANSWER KEY

1. $\frac{1}{26}$ **2.** $\frac{3}{5}$ **3.** $\frac{1}{3}$ **4.** $\frac{1}{2}$

5. $\frac{1}{366}$ OR $\frac{1}{2}$ **6.** (i) $\frac{1}{2}$ (ii) $\frac{1}{2}$

7. (i) $\frac{1}{23}$ (ii) $\frac{5}{46}$ **8.** $\frac{1}{6}$

9. (i) $\frac{5}{12}$ (ii) $\frac{3}{4}$ OR (i) $\frac{3}{13}$ (ii) $\frac{6}{13}$

10. $\frac{11}{12}$ OR (i) $\frac{10}{49}$ (ii) $\frac{3}{49}$

11. (i) $\frac{7}{15}$ (ii) $\frac{8}{15}$ (iii) $\frac{2}{3}$

12. (i) $\frac{1}{3}$ (ii) $\frac{2}{3}$ (iii) $\frac{8}{15}$

13. (i) $\frac{7}{15}$ (ii) $\frac{8}{15}$ (iii) $\frac{3}{5}$

14. (i) $\frac{2}{5}$ (ii) $\frac{4}{15}$ (iii) $\frac{2}{3}$ (iv) $\frac{2}{3}$

15. (i) $\frac{2}{5}$ (ii) $\frac{4}{15}$ (iii) $\frac{2}{3}$ (iv) $\frac{2}{3}$

16. (i) $\frac{7}{15}$ (ii) $\frac{1}{5}$ (iii) $\frac{2}{3}$ (iv) $\frac{2}{3}$

17. (i) $\frac{4}{15}$ (ii) $\frac{2}{5}$ (iii) $\frac{2}{3}$ (iv) $\frac{2}{3}$

18. (i) $\frac{7}{15}$ (ii) $\frac{2}{3}$

19. $\frac{11}{13}$ **20.** $\frac{77}{80}$ OR $\frac{2}{7}$

21. (i) $\frac{7}{9}$ (ii) $\frac{7}{9}$ (iii) $\frac{4}{9}$

22. (i) $\frac{7}{18}$ (ii) $\frac{11}{18}$ (iii) $\frac{13}{18}$ (iv) $\frac{1}{2}$

23. (i) $\frac{2}{13}$ (ii) $\frac{12}{13}$ (iii) $\frac{1}{2}$ (iv) $\frac{11}{13}$

24. (i) $\frac{4}{13}$ (ii) $\frac{1}{26}$ (iii) $\frac{11}{13}$ (iv) $\frac{2}{13}$

25. (i) $\frac{8}{19}$ (ii) $\frac{8}{19}$ (iii) $\frac{16}{19}$ (iv) $\frac{9}{19}$

26. (i) $\frac{11}{35}$ (ii) $\frac{1}{7}$ (iii) $\frac{16}{35}$

27. (i) $\frac{1}{22}$ (ii) $\frac{9}{22}$ (iii) $\frac{1}{22}$ (iv) $\frac{3}{22}$

28. (i) $\frac{1}{8}$ (ii) $\frac{5}{48}$ **29.** 15

30. (i) $\frac{7}{16}$ (ii) $\frac{1}{4}$ **31.** (i) $\frac{3}{49}$ (ii) $\frac{3}{49}$ (iii) $\frac{23}{49}$

32. (i) $\frac{13}{49}$ (ii) $\frac{3}{49}$ (iii) $\frac{23}{49}$

33. (i) $\frac{25}{36}$ (ii) $\frac{11}{36}$ (iii) $\frac{1}{36}$ OR (i) $\frac{1}{2}$ (ii) $\frac{3}{43}$ (iii) $\frac{13}{86}$

EXERCISE – III MULTIPLE CHOICE QUESTIONS

Q.1 If the probability of occurrence of an event E, P(E) is 0.99, then the probability of not occurrence of event P (not E) is
(A) –0.99 (B) 0.9
(C) 0.1 (D) 0.01

Q.2 A bag contains 5 white balls and 7 red balls. A ball is drawn at random from the bag. The probability that it is either a white ball or a red ball is
(A) $\frac{5}{12}$ (B) $\frac{7}{12}$
(C) 1 (D) $\frac{5}{7}$

Q.3 A die is thrown once. The probability of getting a prime number is
(A) $\frac{1}{2}$ (B) $\frac{2}{3}$
(C) $\frac{1}{3}$ (D) none of these

Q.4 There are nine cards bearing numbers 1, 2, 3, 4,..... 8, 9 in a bag. A card is drawn at random from the bag. The probability of getting a card having a multiple of 3 is
(A) $\frac{2}{3}$ (B) $\frac{1}{9}$
(C) $\frac{1}{3}$ (D) $\frac{2}{9}$

Q.5 A bag contains 3 red, 4 blue and 2 yellow balls. A ball is drawn at random from the bag. The probability that it is not a yellow ball is
(A) $\frac{1}{4}$ (B) $\frac{1}{3}$
(C) $\frac{4}{9}$ (D) $\frac{7}{9}$

Q.6 Two coins are tossed once. The probability of getting atleast one head is
(A) $\frac{1}{4}$ (B) $\frac{1}{2}$
(C) $\frac{3}{4}$ (D) 1

Q.7 A card is drawn from a well shuffled deck of 52 playing cards. The probability that it is not an ace is
(A) $\frac{3}{4}$ (B) $\frac{1}{4}$
(C) $\frac{9}{13}$ (D) $\frac{12}{13}$

Q.8 A card is drawn from a pack of 52 cards. The probability that it is a face card, is
(A) $\frac{4}{13}$ (B) $\frac{3}{13}$
(C) $\frac{2}{13}$ (D) $\frac{1}{13}$

Q.9 In a single throw of a pair of dice, the probability that both dice have the same number, is
(A) $\frac{1}{6}$ (B) $\frac{1}{3}$
(C) $\frac{2}{3}$ (D) $\frac{1}{9}$

Q.10 A pair of dice is thrown once. The probability of having a sum 11 on the two dice is
(A) $\frac{1}{36}$ (B) $\frac{1}{12}$
(C) $\frac{1}{18}$ (D) $\frac{1}{9}$

Q.11 The probability of getting a number greater than 2, in a single throw of a die is
(A) $\frac{3}{5}$ (B) $\frac{2}{3}$
(C) $\frac{1}{3}$ (D) $\frac{2}{5}$

Q.12 Two dice are thrown once. The probability that the sum of the two numbers on them is 13, is
(A) $\frac{1}{9}$ (B) 1
(C) 0 (D) $\frac{1}{2}$

Q.13 Which of the following cannot be the probability of an event ?
(A) $\frac{2}{3}$ (B) 15%
(C) 0.7 (D) –1.5

Q.14 Five cards–the ten, jack, queen, king and ace of diamonds are well shuffled with their face downwards. One cards is then picked up at random. The probability of having a queen is
(A) $\frac{1}{13}$ (B) $\frac{4}{47}$
(C) $\frac{3}{47}$ (D) $\frac{1}{5}$

Q.15 A lot of 20 bulbs contains 4 defective bulbs. A bulb is drawn at random. The probability of having a good bulb is

(A) $\frac{1}{4}$ (B) $\frac{1}{5}$

(C) $\frac{4}{5}$ (D) none

Q.16 The probability of a non leap year having 53 Mondays is

(A) $\frac{2}{7}$ (B) $\frac{5}{7}$

(C) $\frac{6}{7}$ (D) $\frac{1}{7}$

Q.17 Which of the following cannot be the probability of an event ?

(A) 0.7 (B) $\frac{2}{3}$

(C) –1.2 (D) 18%

Q.18 Out of one digit prime numbers, one number is selected at random. The probability of selecting an even number is

(A) $\frac{1}{2}$ (B) $\frac{1}{4}$

(C) $\frac{4}{9}$ (D) $\frac{2}{5}$

Q.19 Out of vowels of the English alphabet, one letter is selected at random. The probability of selecting 'e' is

(A) $\frac{1}{26}$ (B) $\frac{5}{26}$

(C) $\frac{1}{4}$ (D) $\frac{1}{5}$

Q.20 A die is thrown once. The probability of getting a prime number is

(A) $\frac{1}{2}$ (B) $\frac{1}{3}$

(C) $\frac{1}{6}$ (D) 1

Q.21 A fair die is thrown once. The probability of getting an odd prime number is

(A) $\frac{1}{6}$ (B) $\frac{2}{3}$

(C) $\frac{1}{3}$ (D) $\frac{1}{2}$

Q.22 A fair die is thrown once. The probability of getting a composite number less than 5 is

(A) $\frac{1}{3}$ (B) $\frac{1}{6}$

(C) $\frac{2}{3}$ (D) 0

Q.23 A bag contains 4 red balls and 5 green balls. One ball is drawn at random from the bag. The probability of getting either a red ball or a green ball is

(A) $\frac{4}{9}$ (B) $\frac{5}{9}$

(C) 0 (D) 1

Q.24 A card is drawn from a well shuffled pack of 52 playing cards. The event E is that the card drawn is not a face card. The number of outcomes favourable to the event E is

(A) 51 (B) 40

(C) 36 (D) 12

Q.25 If one card is drawn from a well shuffled pack of 52 cards, the probability of getting an ace is

(A) $\frac{1}{52}$ (B) $\frac{4}{13}$

(C) $\frac{2}{13}$ (D) $\frac{1}{13}$

Q.26 A bag contains 5 red, 4 white and 3 black balls. If a ball is drawn from the bag at random, then the probability of the ball being not black is

(A) $\frac{5}{12}$ (B) $\frac{1}{3}$

(C) $\frac{3}{4}$ (D) $\frac{1}{4}$

Q.27 If a number is randomly chosen from the numbers 1, 2, 3, 4,....., 25, then the probability of the number to be prime is

(A) $\frac{7}{25}$ (B) $\frac{9}{25}$

(C) $\frac{11}{25}$ (D) $\frac{13}{25}$

Q.28 A box contains 90 cards numbered 1 to 90. If one card is drawn from the box at random, then the probability that the number on the card is a perfect square is

(A) $\frac{1}{10}$ (B) $\frac{9}{100}$

(C) $\frac{1}{9}$ (D) $\frac{3}{100}$

Q.29 If a letter is chosen at random from the letter of English alphabet, then the probability that it is letter of the word 'DELHI' is

(A) $\frac{1}{5}$ (B) $\frac{1}{26}$

(C) $\frac{5}{26}$ (D) $\frac{21}{26}$

Q.30 A box contains 200 oranges. If one orange is taken out from the box at random and the probability of its being rotten is 0.05, then the number of rotten oranges in the box is

(A) 5 (B) 10

(C) 20 (D) 2

Q.31 If a fair die is rolled once, then the probability of getting an even number or a number greater than 4 is

(A) $\frac{1}{2}$ (B) $\frac{1}{3}$

(C) $\frac{5}{6}$ (D) $\frac{2}{3}$

Q.32 If a card is drawn from a well shuffled pack of 52 playing cards, then the probability of this card being a king or a jack is

(A) $\frac{1}{26}$ (B) $\frac{1}{13}$

(C) $\frac{2}{13}$ (D) $\frac{4}{13}$

Q.33 If a (fair) coin is tossed twice, then the probability of getting two heads is

(A) $\frac{1}{4}$ (B) $\frac{1}{2}$

(C) $\frac{3}{4}$ (D) 0

Q.34 If two coins are tossed simultaneously, then the probability of getting atleast one head is

(A) $\frac{1}{4}$ (B) $\frac{1}{2}$

(C) $\frac{3}{4}$ (D) 1

Q.35 Lakshmi tosses two coins simultaneously. The probability that she gets atmost one head is

(A) 1 (B) $\frac{3}{4}$

(C) $\frac{1}{2}$ (D) $\frac{1}{7}$

Q.36 The probability that a non-leap year selected at random has 53 Sunday's is

(A) $\frac{1}{365}$ (B) $\frac{2}{365}$

(C) $\frac{2}{7}$ (D) $\frac{1}{7}$

Q.37 Rashmi has a die whose six faces show the letters as given below :

A	B	C	D	A	C

If she throws the die once, then the probability of getting A is

(A) $\frac{1}{3}$ (B) $\frac{1}{4}$

(C) $\frac{1}{5}$ (D) $\frac{1}{6}$

Q.38 In the above question, the probability of Rashmi getting D is

(A) $\frac{1}{5}$ (B) $\frac{1}{6}$

(C) $\frac{1}{4}$ (D) $\frac{1}{3}$

Q.39 In a simultaneous throw of two coins, the probability of getting at least one head is

(A) $\frac{1}{2}$ (B) $\frac{1}{3}$ **[NTSE]**

(C) $\frac{2}{3}$ (D) $\frac{3}{4}$

Q.40 Three unbiased coins are tossed. What is the probability of getting at least 2 heads? **[NTSE]**

(A) $\frac{1}{4}$ (B) $\frac{1}{2}$

(C) $\frac{1}{3}$ (D) $\frac{1}{8}$

Q.41 Three unbiased coins are tossed. What is the probability of getting at most two heads? **[NTSE]**

(A) $\frac{3}{4}$ (B) $\frac{1}{4}$

(C) $\frac{3}{8}$ (D) $\frac{7}{8}$

Q.42 In a single throw of a die, what is the probability of getting a number greater than 4? **[NTSE]**

(A) $\frac{1}{2}$ (B) $\frac{1}{3}$

(C) $\frac{2}{3}$ (D) $\frac{1}{4}$

Q.43 In a simultaneous throw of two dice, what is the probability of getting a total of 7? **[NTSE]**

(A) $\frac{1}{6}$ (B) $\frac{1}{4}$

(C) $\frac{2}{3}$ (D) $\frac{3}{4}$

Q.44 What is the probability of getting a sum 9 from two throws of a dice? **[NTSE]**

(A) $\frac{1}{6}$ (B) $\frac{1}{8}$

(C) $\frac{1}{9}$ (D) $\frac{1}{12}$

Q.45 In a simultaneous throw of two dice, what is the probability of getting a doublet? **[NTSE]**

(A) $\frac{1}{6}$ (B) $\frac{1}{4}$

(C) $\frac{2}{3}$ (D) $\frac{3}{7}$

Q.46 In a simultaneous throw of two dice, what is the probability of getting a total of or 11? **[NTSE]**

(A) $\frac{1}{4}$ (B) $\frac{1}{6}$

(C) $\frac{7}{12}$ (D) $\frac{5}{36}$

Q.47 Two dice are thrown simultaneously. What is the probability of getting two numbers whose product is even? **[NTSE]**

(A) $\frac{1}{2}$ (B) $\frac{3}{4}$

(C) $\frac{3}{8}$ (D) $\frac{5}{16}$

Q.48 Tickets numbered 1 to 20 are mixed up and then a ticket is drawn at random. What is the probability that the ticket drawn bears a number which is a multiple of 3? **[NTSE]**

(A) $\frac{3}{10}$ (B) $\frac{3}{20}$

(C) $\frac{2}{5}$ (D) $\frac{1}{2}$

Q.49 Tickets numbered 1 to 20 are mixed up and then a ticket is drawn at random. What is the probability that the ticket drawn has a number which is a multiple of 3 or 5? **[NTSE]**

(A) $\frac{1}{2}$ (B) $\frac{2}{5}$

(C) $\frac{8}{15}$ (D) $\frac{9}{20}$

Q.50 In a lottery, there are 10 prizes and 25 blanks. A lottery is drawn at random. What is the probability of getting a prize? **[NTSE]**

(A) $\frac{1}{10}$ (B) $\frac{2}{5}$

(C) $\frac{8}{15}$ (D) $\frac{9}{20}$

ANSWER KEY

1.	D	**2.**	C	**3.**	A	**4.**	C
5.	D	**6.**	C	**7.**	D	**8.**	B
9.	A	**10.**	C	**11.**	B	**12.**	C
13.	D	**14.**	D	**15.**	C	**16.**	D
17.	C	**18.**	B	**19.**	D	**20.**	A
21.	C	**22.**	B	**23.**	D	**24.**	B
25.	D	**26.**	C	**27.**	B	**28.**	A
29.	C	**30.**	B	**31.**	D	**32.**	C
33.	A	**34.**	C	**35.**	B	**36.**	D
37.	A	**38.**	B	**39.**	D	**40.**	B
41.	D	**42.**	B	**43.**	A	**44.**	C
45.	A	**46.**	D	**47.**	A	**48.**	A
49.	D	**50.**	C				

EXERCISE – IV NTSE /OLYMPIAD /FOUNDATION PROBLEMS

OBJECTIVE TYPE QUESTIONS

CHOOSE THE CORRECT OPTION IN EACH OF THE FOLLOWING

1. Find the probability of getting a head in a throw of a coin.

(A) $\frac{1}{2}$ (B) 1

(C) 2 (D) None of these

Directions (for Q.No. 2-5) : Two fair coins are tossed simultaneously. Find the probability of

2. Getting only one head

(A) $\frac{1}{2}$ (B) $\frac{1}{3}$

(C) $\frac{2}{3}$ (D) $\frac{3}{4}$

3. Getting atleast one head

(A) $\frac{1}{4}$ (B) $\frac{3}{4}$

(C) $\frac{1}{2}$ (D) $\frac{3}{8}$

4. Getting two heads

(A) $\frac{2}{7}$ (B) $\frac{1}{4}$

(C) $\frac{1}{2}$ (D) $\frac{4}{5}$

5. Getting atleast two heads

(A) $\frac{3}{4}$ (B) $\frac{1}{2}$

(C) $\frac{1}{4}$ (D) 1

Directions (for Q.No. 6-12) : Three fair coins are tossed simultaneously. Find the probability of

6. Getting one head

(A) 0 (B) $\frac{3}{4}$

(C) $\frac{5}{8}$ (D) $\frac{3}{8}$

7. Getting one tail

(A) 1 (B) $\frac{1}{4}$

(C) $\frac{5}{8}$ (D) $\frac{3}{8}$

8. Getting atleast one head

(A) $\frac{7}{8}$ (B) $\frac{1}{8}$

(C) $\frac{3}{4}$ (D) $\frac{1}{4}$

9. Getting two heads

(A) $\frac{3}{5}$ (B) $\frac{3}{8}$

(C) $\frac{5}{8}$ (D) $\frac{2}{5}$

10. Getting atleast two heads

(A) $\frac{3}{8}$ (B) $\frac{7}{8}$

(C) $\frac{1}{2}$ (D) $\frac{1}{4}$

11. Getting atleast one head and one tail

(A) $\frac{2}{8}$ (B) $\frac{1}{2}$

(C) $\frac{3}{10}$ (D) $\frac{3}{4}$

12. Getting more heads than the number of tails

(A) 2 (B) $\frac{7}{8}$

(C) $\frac{5}{8}$ (D) $\frac{1}{2}$

Directions (for Q.No. 13-16) : An unbiased die is rolled. Find the probability of

13. Getting a number less than 7 but greater than 0.

(A) 0 (B) $\frac{3}{4}$

(C) 1 (D) $\frac{7}{8}$

14. Getting a multiple of 3.

(A) $\frac{1}{6}$ (B) $\frac{1}{3}$

(C) $\frac{5}{6}$ (D) None of these

15. Getting a prime number.

(A) $\frac{1}{2}$ (B) $\frac{3}{5}$

(C) $\frac{5}{7}$ (D) $\frac{5}{8}$

16. Getting an even number.

(A) $\frac{1}{2}$ (B) $\frac{4}{5}$

(C) $\frac{2}{8}$ (D) $\frac{3}{4}$

Directions (for Q.No. 17 and 18) : A coin is tossed successively three times. Find the probability of

17. Getting exactly one head or two heads.

(A) $\frac{1}{4}$ (B) $\frac{3}{4}$

(C) $\frac{1}{2}$ (D) $\frac{3}{8}$

18. Getting no heads.

(A) 0 (B) 1

(C) $\frac{1}{8}$ (D) $\frac{7}{8}$

Directions (for Q.No. 19-27) : Two dice are rolled simultaneously. Find the probability of

19. Getting a total of 9

(A) $\frac{1}{3}$ (B) $\frac{1}{9}$

(C) $\frac{8}{9}$ (D) $\frac{9}{10}$

20. Getting a sum greater than 9.

(A) $\frac{10}{11}$ (B) $\frac{5}{6}$

(C) $\frac{1}{6}$ (D) $\frac{8}{9}$

21. Getting a total of 9 or 11.

(A) $\frac{2}{99}$ (B) $\frac{20}{99}$

(C) $\frac{1}{6}$ (D) $\frac{1}{10}$

22. Getting a doublet

(A) $\frac{1}{12}$ (B) 0

(C) $\frac{5}{8}$ (D) $\frac{1}{6}$

23. Getting a doublet of even numbers.

(A) $\frac{5}{8}$ (B) $\frac{1}{12}$

(C) $\frac{3}{4}$ (D) $\frac{1}{4}$

24. Getting a multiple of two on one die and a multiple of three on the other.

(A) $\frac{15}{36}$ (B) $\frac{25}{36}$

(C) $\frac{11}{36}$ (D) $\frac{5}{6}$

25. Getting the sum of numbers on the two faces divisible by 3 or 4.

(A) $\frac{4}{9}$ (B) $\frac{1}{7}$

(C) $\frac{5}{9}$ (D) $\frac{7}{12}$

26. Getting the sum as a prime number.

(A) $\frac{3}{5}$ (B) $\frac{5}{12}$

(C) $\frac{1}{2}$ (D) $\frac{3}{4}$

27. Getting atleast one 5.

(A) $\frac{3}{5}$ (B) $\frac{1}{5}$

(C) $\frac{5}{36}$ (D) $\frac{11}{36}$

Directions (for Q.No. 28-35) : One card is drawn from a pack of 52 cards, each of the 52 cards being equally likely to be drawn. Find the probability that

28. The card drawn is black.

(A) $\frac{1}{2}$ (B) $\frac{1}{4}$

(C) $\frac{8}{13}$ (D) can't be determined

29. The card drawn is a queen.

(A) $\frac{1}{12}$ (B) $\frac{1}{13}$

(C) $\frac{1}{4}$ (D) $\frac{3}{4}$

30. The card drawn is black and a queen.

(A) $\frac{1}{13}$ (B) $\frac{1}{52}$

(C) $\frac{1}{26}$ (D) $\frac{5}{6}$

31. The card drawn is either black or a queen.

(A) $\frac{15}{26}$ (B) $\frac{13}{17}$

(C) $\frac{7}{13}$ (D) $\frac{5}{26}$

32. The card drawn is either king or a queen.

(A) $\frac{5}{26}$ (B) $\frac{1}{13}$

(C) $\frac{2}{13}$ (D) $\frac{12}{13}$

33. The card drawn is either a heart, a king or a queen.

(A) $\frac{17}{52}$ (B) $\frac{21}{52}$

(C) $\frac{19}{52}$ (D) $\frac{9}{26}$

34. The card drawn is neither a spade nor a king.

(A) 0 (B) $\frac{9}{13}$

(C) $\frac{1}{2}$ (D) $\frac{4}{13}$

35. The card drawn is neither a ace nor a king.

(A) $\frac{11}{13}$ (B) $\frac{1}{2}$

(C) $\frac{2}{13}$ (D) $\frac{11}{26}$

36. From a well shuffled pack of 52 cards, three cards are drawn at random. Find the probability of drawing an ace, a king and a jack.

(A) $\frac{16}{5525}$ (B) $\frac{16}{625}$

(C) $\frac{16}{3125}$ (D) None of these

37. Four cards are drawn at random from a pack of 52 cards. Find the probability of getting all the four cards of same number.

(A) $\frac{17}{1665}$ (B) $\frac{1}{20825}$ (C) $\frac{7}{25850}$ (D) None of these

38. From a well shuffled pack of 52 cards, four cards are accidently dropped. Find the probability that one card is missing from each suit.

(A) $\frac{17}{20825}$ (B) $\frac{2197}{20825}$ (C) $\frac{197}{1665}$ (D) None of these

39. Four cards are drawn at random from a pack of 52 cards. Find the probability of getting all the four cards of different numbers.

(A) $\frac{141}{4165}$ (B) $\frac{117}{833}$ (C) $\frac{264}{4165}$ (D) None of these

Directions (for Q.No. 40-43) : Four dice are thrown simultaneously. Find the probability that

40. All of them show the same face.

(A) $\frac{1}{216}$ (B) $\frac{15}{16}$ (C) $\frac{15}{36}$ (D) $\frac{1}{2}$

41. All of them show the different face.

(A) $\frac{3}{28}$ (B) $\frac{5}{18}$ (C) $\frac{15}{36}$ (D) $\frac{11}{36}$

42. Two of them show the same face and remaining two show the different faces.

(A) $\frac{4}{9}$ (B) $\frac{5}{9}$ (C) $\frac{11}{18}$ (D) $\frac{7}{9}$

43. Atleast two of them show the same face.

(A) $\frac{37}{72}$ (B) $\frac{11}{36}$ (C) $\frac{47}{72}$ (D) $\frac{25}{36}$

44. What is the probability that the number selected from the numbers 1, 2, 3, ..., 20, is a prime

number when each of the given numbers is equally likely to be selected ?

(A) $\frac{7}{10}$ (B) $\frac{2}{15}$

(C) $\frac{2}{5}$ (D) $\frac{3}{5}$

45. Tickets numbered from 1 to 18 are mixed up together and then a ticket is drawn at random . Find the probability that the ticket has a number which is a multiple of 2 or 3.

(A) $\frac{1}{3}$ (B) $\frac{3}{5}$

(C) $\frac{2}{3}$ (D) $\frac{5}{6}$

46. In a lottery of 100 tickets numbered 1 to 100, two tickets are drawn simultaneously. Find the probability that both the tickets drawn have prime numbers.

(A) $\frac{2}{33}$ (B) $\frac{7}{50}$

(C) $\frac{7}{20}$ (D) $\frac{5}{66}$

47. In the previous question, find the probability that none of the tickets drawn has a prime number.

(A) $\frac{29}{66}$ (B) $\frac{17}{33}$

(C) $\frac{37}{66}$ (D) $\frac{17}{50}$

48. Find the probability that a leap year selected at random will contain 53 Sundays.

(A) $\frac{5}{7}$ (B) $\frac{3}{4}$

(C) $\frac{4}{7}$ (D) $\frac{2}{7}$

Directions (for Q.No. 49-53) : A bag contains 8 red and 4 green balls. Find the probability that

49. The ball drawn is red when one ball is selected at random.

(A) $\frac{2}{3}$ (B) $\frac{1}{3}$

(C) $\frac{1}{6}$ (D) $\frac{5}{6}$

50. All the 4 balls drawn are red when 4 balls are drawn at random.

(A) $\frac{17}{32}$ (B) $\frac{14}{99}$

(C) $\frac{7}{12}$ (D) None of these

51. All the 4 balls drawn are green when 4 balls are drawn at random.

(A) $\frac{1}{495}$ (B) $\frac{7}{99}$

(C) $\frac{5}{12}$ (D) $\frac{2}{3}$

52. Two balls are red and one ball is green when three balls are drawn at random.

(A) $\frac{56}{99}$ (B) $\frac{112}{495}$

(C) $\frac{78}{495}$ (D) None of these

53. Three balls are drawn and none of them is red.

(A) $\frac{68}{99}$ (B) $\frac{7}{99}$

(C) $\frac{4}{495}$ (D) None of these

54. The odds in favour of an event are 2:7. Find the probability of occurrence of this event.

(A) $\frac{2}{9}$ (B) $\frac{5}{12}$

(C) $\frac{7}{12}$ (D) $\frac{2}{5}$

55. The odds against of an event are 5:7. Find the probability of occurrence of this event.

(A) $\frac{3}{8}$ (B) $\frac{7}{12}$

(C) $\frac{2}{7}$ (D) $\frac{5}{12}$

56. If there are two children in a family, find the probability that there is atleast one girl in the family.

(A) $\frac{1}{4}$ (B) $\frac{1}{2}$

(C) $\frac{3}{4}$ (D) None of these

57. From a group of 3 men and 2 women, two persons are selected at random. Find the probability that atleast one woman is selected.

(A) $\frac{1}{5}$ (B) $\frac{7}{10}$

(C) $\frac{2}{5}$ (D) $\frac{5}{6}$

58. A box contains 5 defective and 15 non- defective bulbs. Two bulbs are chosen at random. Find the probability that both the bulbs are non-defective.

(A) $\frac{5}{19}$ (B) $\frac{3}{20}$

(C) $\frac{21}{38}$ (D) None of these

59. In the previous question, find the probability that atleast 3 bulbs are defective when 4 bulbs are selected at random.

(A) $\frac{31}{969}$ (B) $\frac{7}{20}$

(C) $\frac{1}{20}$ (D) None of these

OBJECTIVE — ANSWER KEY — EXERCISE -4

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	A	A	B	B	C	D	D	A	B	C	D	D	C	B	A
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	A	B	C	B	C	C	D	B	C	C	B	D	A	B	C
Que.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Ans.	C	C	C	B	A	A	B	B	C	A	B	B	C	C	C
Que.	46	47	48	49	50	51	52	53	54	55	56	57	58	59	
Ans.	A	C	D	A	B	A	B	C	A	B	C	B	C	A	